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ROIT

Construction Methods

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PUMPED CONCRETE for produce market structures at Kansas City, Mo., is delivered by pipe lines up to 900 ft. long, distributed by carts and vibrated internally.

STRIKES AND LOCKOUTS BARRED — Pennsylvania Contractors and Craft Unions Adopt Regional Labor Agreement — Comment by J. S. Miller, vice-president, The Dravo Corp.

★
Pumped Concrete Builds Produce Market Structures

★
High-Speed Tractors Tackle Tough Loose Job

★
Paving Tempo Stepped Up With Modern Equipment — By M. E. Adelstein

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HOW TO GET BETTER SERVICE FROM WIRE ROPE — By Walter C. Richardson

**FEBRUARY
1940**



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Sure, he's proud of his Dad! And, his Dad and numerous other structural shop executives are proud of the bridges and buildings they fabricate with structural sections and plates made by Inland.

Their preference for Inland results from the helpful co-operation of Inland engineers and field men in solving tough technical problems—and, the ability of the mill to put steel where it is wanted and when it is wanted from start to finish of each job.

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CURRENT JOBS

.... and Who's Doing Them

HEAVY CONSTRUCTION

Sepulveda dam near Los Angeles, Calif., is to be built by **Jahn & Bressi-Bevanda Contractors, Inc.**, **David G. Gordon & Jos. A. Dowling**, Los Angeles, under \$3,121,000 contract. For dredging in San Diego harbor, California, **Standard Dredging Co.**, Los Angeles, has been awarded \$789,000 contract. **Benjamin Foster Co.**, Philadelphia, Pa., holds \$1,206,000 contract for Indian Rock dam in Pennsylvania. In connection with Conchas dam, New Mexico, **Utah Construction Co.**, Ogden, Utah, and **Griffith Co.**, Los Angeles, Calif., will build bridges and siphons for \$562,000 and **Jahn-Bressi-Bevanda**, Los Angeles, will construct tunnels for \$1,310,000. **Williams Bros. Corp.**, Tulsa, Okla., holds general contract for gasoline pipe line estimated at \$1,500,000 from Atlanta, Ga., to Chattanooga, Tenn., for Gulf Oil Corp. **Consolidated Steel Co.**, Los Angeles, Calif., will erect \$688,000 wind tunnel at Moffett Field, Calif. Among recent low bids were the following: Brooklyn, N. Y.: boardwalk, \$768,000, from **Arthur A. Johnson & Necaro Co.**, New York; sea-wall, \$663,000, from **Garolano Construction Co.**, New York; pump and blower house for sewage treatment works, \$1,264,000, from **Stock Construction Co.**, New York. Chicago, Ill.: west substructure, South District filtration plant, \$2,231,000, from **Michael Pontarelli & Son**, Chicago; subway stations, \$624,000, from **Paschen Contractors, Inc.**, Chicago.

HIGHWAYS AND BRIDGES

Among recent highway awards are the following: Alabama: \$326,000 to **W. L. Cobb Construction Co.**, Decatur, Ga. Illinois: \$227,000 to **R. McCalman, Inc.**, Danville, Ill. Mississippi: \$260,000 to **W. E. Wolfe Construction Co.**, St. Augustine, Fla. New Jersey: \$386,000 to **Franklin Contracting Co.**, Newark, N. J. New York: \$419,000 to **Warren Bros. Roads Co.**, Cambridge, Mass., and \$324,000 to **Lane Construction Corp.**, Meriden, Conn. Pennsylvania Turnpike Commission: \$293,000 to **Walker Bros.**, Chambersburg, Pa., \$412,000 to **William O'Neil Sons Co.**, Faribault, Minn., and \$378,000 to **F. Mashuda**, Milwaukee, Wis. Tennessee: \$225,000 to **Foster & Creighton Co.**, Nashville, Tenn. Texas: Two contracts totaling \$366,000 to **Dean Ward**, San Antonio, Tex., two contracts totaling \$306,000 to **Allhand & Briley & Schwarzell**, Dallas, Tex., and one contract for \$337,000 to **L. H. Lacy Co.**, Dallas.

Low bids for steel superstructures of two large bridges were tendered recently: For Pitt River bridge of Central Valley project, California, \$2,588,000 from **American Bridge Co.**, Pittsburgh, Pa., and for St. Johns River bridge, Florida, \$719,000, from **Mount Vernon Bridge Co.**, Mount Vernon, Ohio. Among bridge awards were the following: California: Sacramento River bridge, \$673,000, to **United Concrete Pipe Corp.**, Los Angeles, Massachusetts: \$255,000 to **B. A. Gardetto, Inc.**, Roxbury, Mass. New York: Grade separations, \$757,000, to **Lane Construction Corp.**, Meriden, Conn. Oregon: \$220,000 to **R. L. Houck**, Salem, Ore. Texas: Two contracts, \$214,000 and \$136,000, to **Austin Bridge Co.**, Dallas. In Missouri, low bidder on two bridge jobs was **Massman Construction Co.**, Kansas City, Mo., at \$233,000 and \$323,000.

BUILDINGS

Public—Among largest recent contracts and low bids on public housing projects are the following: Los Angeles, Calif., \$1,188,000 contract to **Baruch Corp.**, Los Angeles; \$1,149,000 contract to **C. L. Peck**, Los Angeles; low bid of \$1,237,000 from **B. O. Larsen**, San Diego, Calif.;—Atlanta, Ga., \$2,013,000 contract to **Virginia Engineering Co.**, Newport News, Va.; two contracts for \$1,074,000 and \$1,487,000 to **A. Farnell Blair**, Decatur, Ga.;—Savannah, Ga., \$1,349,000 contract to **Charles W. Angle, Inc.**, Greensboro, N. C.;—New Orleans, La., low bid of \$2,934,000 from **J. A. Jones Construction Co.**, Charlotte, N. C.;—Fall River Mass., \$1,291,000 contract to **M. Spinelli & Sons Co., Inc.**, Boston, Mass.;—Baltimore, Md., \$1,844,000 contract to **John McShain, Inc.**, Baltimore;—Newark, N. J., \$1,749,000 contract to **Frank Briscoe Co., Inc.**, Newark;—Pittsburgh, Pa., \$3,897,000 contract to **Hunkin-Conkey Construction Co.**, Cleveland, Ohio.

Industrial—At Riverdale, Ill., **United Engineering & Foundry Co.**, Chicago, is building cold reduction mill in \$1,500,000 program. Work in connection with construction or enlargement of power plants has been awarded as follows: Miami, Fla., (total cost \$3,000,000) excavation and sheet piling to **Reed Construction Co.**, Miami; Rochester, N. Y., \$848,000, to **A. W. Hopeman & Sons Co.**, Rochester; Milwaukee, Wis. (estimated total, \$4,000,000) building contract to **Dahlman Construction Co.**, Milwaukee; LaCrosse, Wis. (estimated total, \$1,560,000) superstructure contract to **Lovering & Co.**, St. Paul, Minn.; Coralville, Ia., building contract for about \$200,000 to **Smith & Burger Co.**, Iowa City, Ia.; Power, W. Va., (estimated total, \$7,000,000) general contract and turbines to **General Electric Co.**, Schenectady, N. Y.

FEBRUARY, 1940

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Established 1919

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Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

ROBERT K. TOMLIN, Editor Editorial Staff: Vincent B. Smith,
A. E. PAXTON, Manager Paul Wootton (Washington),
Nelle Fitzgerald

Established in 1919

A McGRAW-HILL PUBLICATION

The HOW of it

- How **ROLLING CHUTE** distributed grout to rock-paved river banks. — p. 35
- How **THIN PRECAST SLABS** of architectural concrete served dual purpose on bridge abutments. — p. 36
- How **LABOR AGREEMENT** was negotiated to avert strikes and lockouts. — p. 38
- How **HEAVY CONSTRUCTION** could operate closed-shop when jurisdictional disputes were outlawed. — p. 39
- How **LONG PIPE LINE** delivered concrete from central pumping plant to four buildings. — p. 40
- How **MARKED PANEL FORMS** simplified and speeded erection by carpenters. — p. 42
- How **DIESEL TRACTORS** of lightweight high-speed design handled tough levee job. — p. 43
- How **PUSHER TRACTORS** speeded loading of scrapers in gumbo soil. — p. 44
- How **STEEL TUNNEL SECTIONS** were prefabricated on land, floated and lined with concrete. — p. 45
- How **WIRE ROPES** have been graded and constructed to meet various service requirements. — p. 46
- How **SHEAVES AND DRUMS** have affected wear of wire ropes. — p. 50
- How **RUBBER BELTS** were used as slings to handle marble. — p. 51
- How **WELDED STEEL CORES** were fabricated for large-diameter aqueduct pipe. — p. 52
- How **STEEL GRATING** furnished lightweight flooring for bridge roadways. — p. 53
- How **HOMEMADE SAFETY STEPS** were attached to truck beds. — p. 54
- How **SPECIAL EQUIPMENT** aided construction of pipe lines. — p. 55
- How **INVERTED I-BEAM TROLLEYS** rolled falsework stringers under bridge deck. — p. 56
- How **HIGH-SPEED PAVING PLANT** completed concrete slab at record pace. — p. 58
- How **FLOATING BOILER PLANT** furnished steam heat for cold-weather concrete in dam. — p. 60

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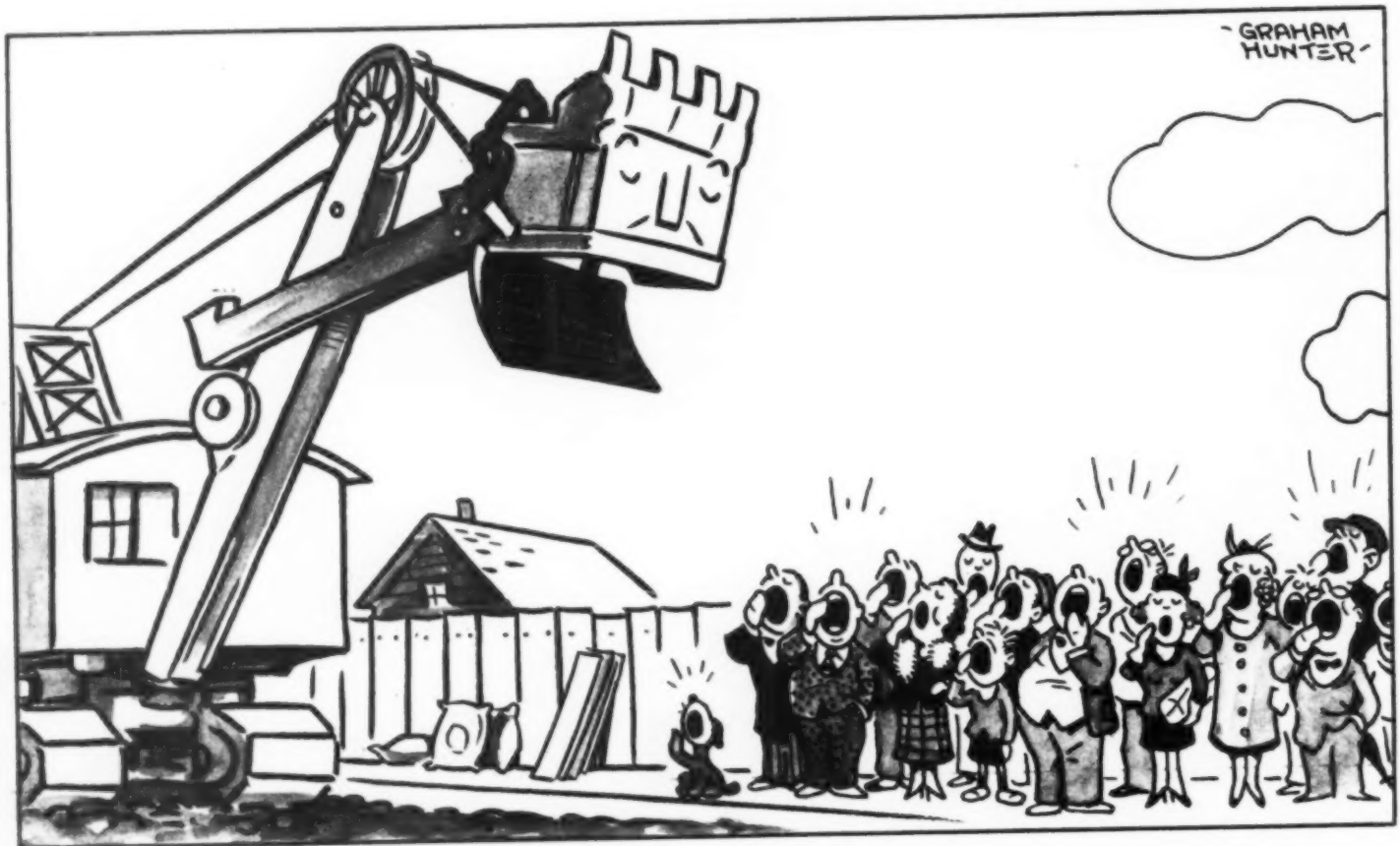
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"Force of habit"

"No Spares"

WHEN YOU USE 'INCOR',
—SAY E. A. WHITNEY & SON

IN the old days, before 'Incor', E. A. Whitney & Son, Kansas City, Mo., piling contractors, used to precast 5 to 10 extra piles for every job — "spares" that came in handy in case of breakage. But experience with 'Incor' quickly proved that, as Mr. Whitney puts it, "you don't need any spares when you cast piles with 'Incor'."

On Kansas City, Kan., Market and Food Terminal (J. A. Tobin Construction Co., general contractor), 1264 33-foot 'Incor' piles were driven 3 to 5 days after casting, without fracture or loss of a single pile. Piles were driven by a No. 1 Vulcan hammer, using a 5000-lb. ram, requiring 34 to 36 blows per foot.

'Incor' cures or hardens in one-fifth the usual time. In precast products, that means savings through faster use of pallets or

forms, reduced stock-pile requirements, faster capital turnover. In building construction, 'Incor' cuts heat-protection expense . . . saves money through reduced form costs and lower job overhead, too.

Use 'Incor'* wherever dependable high early strength or faster job curing shows a net profit; elsewhere, use Lone Star, the quality standard ever since 1900. Write for copy of "Cutting Concrete Costs." Lone Star Cement Corporation, Room 2262, 342 Madison Avenue, New York.

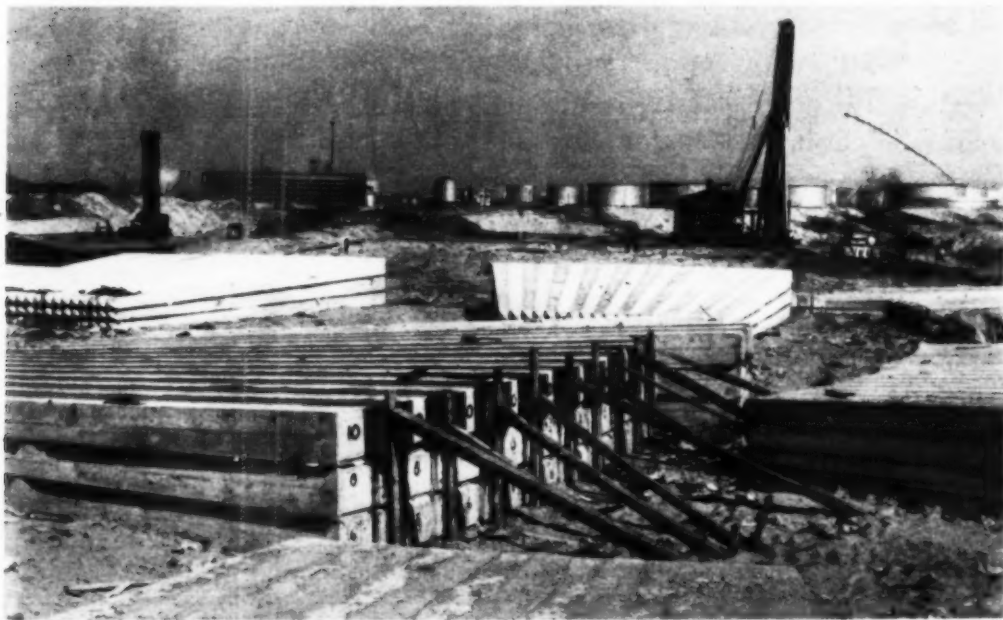
*Reg. U. S. Pat. Off.

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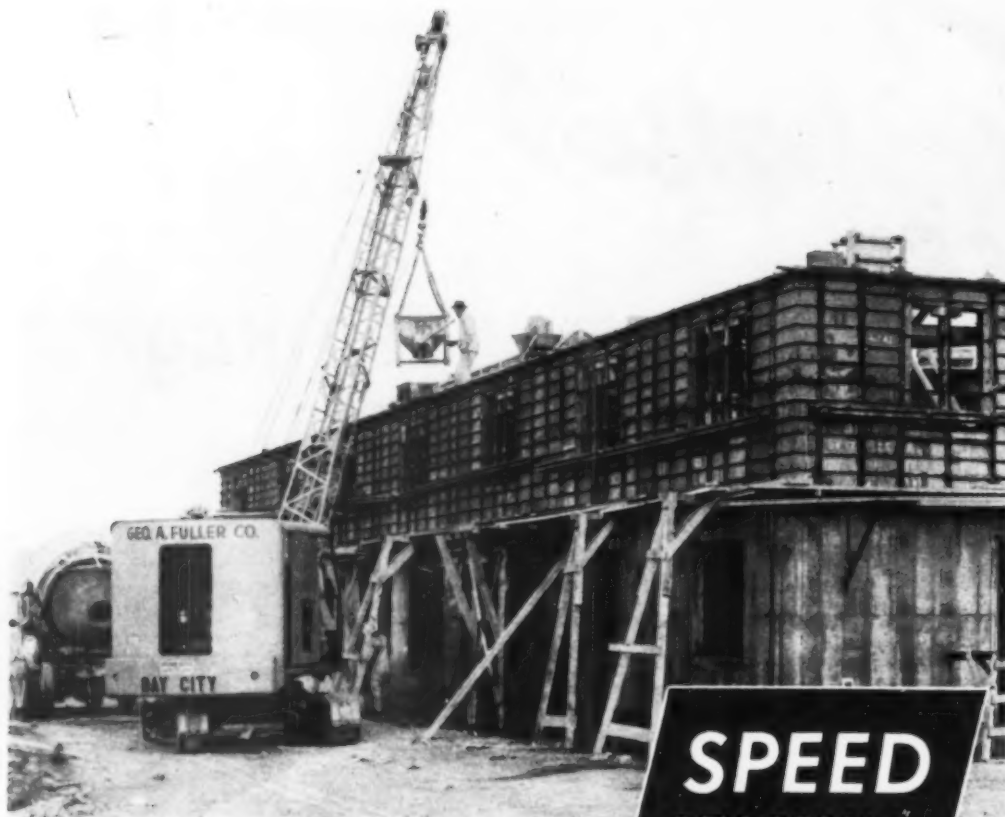
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(Above) 'Incor' can take it! 33-ft. 'Incor' pile being swung into position for driving by No. 1 Vulcan hammer, using 5000-lb. ram; 34-36 blows required per foot; at Kansas City, Kan., Market and Food Terminal project. (Left) 1264 'Incor' piles precast and driven without fracture or loss of a single pile. Contractor didn't make any "spares," knew that with 'Incor' he'd have no need for them.



LONE STAR CEMENT CORPORATION
MAKERS OF LONE STAR CEMENT . . . 'INCOR' 24-HOUR CEMENT



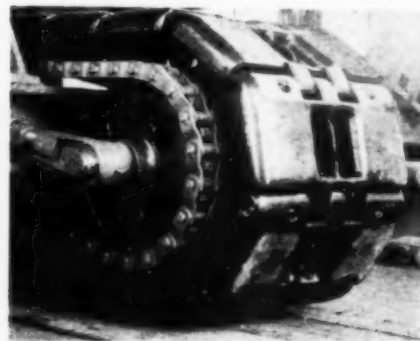
George A. Fuller Co., using a $\frac{1}{2}$ yard BAY CITY crane equipped with a 45 foot boom to place concrete on the Carmelitos Housing Project near Los Angeles. Project covers construction of a complete community involving 607 dwellings in 87 reinforced buildings.

The satisfactory performance, speed, stamina and stability of the BAY CITY on all kinds of work is the result of sound engineering design, backed by more than 25 years of experience. From the ground up these sturdy, husky machines are built to meet your requirements for low cost, economical operation. Wide, long crawlers and proper balance, plus use of unit-cast alloy steel bases provide *big crane capacities* and with helical gears in main power drive from engine to front drum you get quieter, smoother operation. Tandem drums and design characteristics permit full convertibility without machinery change. A few cost reducing advantages, standard on all BAY CITY machines from $\frac{3}{8}$ yard are shown here—you can get complete details and specifications by writing for 32 page illustrated General Catalog H-2.

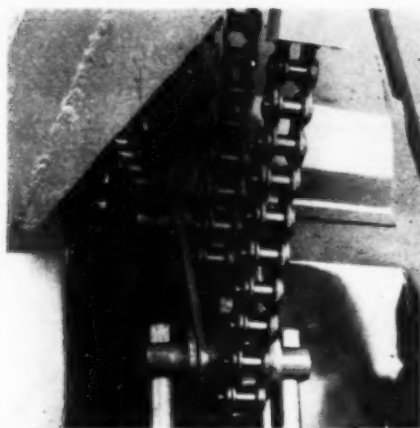
BAY CITY SHOVELS, INC., BAY CITY, MICHIGAN

Export Office: H. M. Hein, 330 W. 42nd St., New York, N. Y. (Opapa)

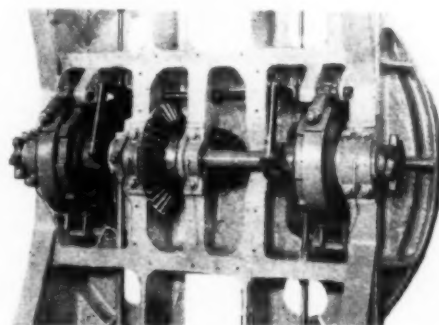
Here are a few of the many cost reducing advantages—standard on the BAY CITY



— This unique on-board bearing on crawler drive is but one of many ways in which maintenance cost is reduced in standard construction.



— Wider working ranges, with bigger yardage result from this powerful one-piece crowd chain and it reduces maintenance costs.



— No stopping to shift—Fast, easy travel and steering under full power in either direction by simply applying pressure on cone clutches which operate brakes.

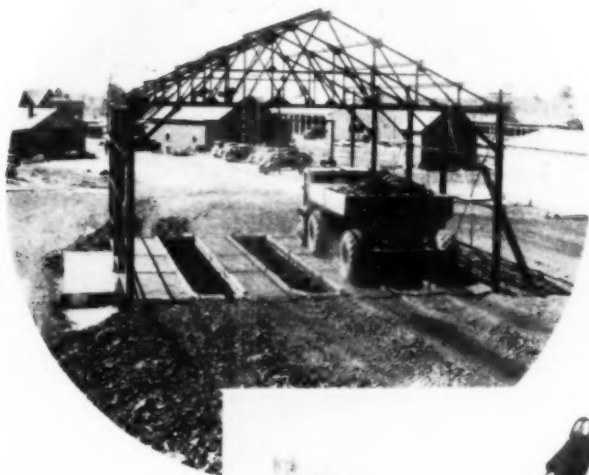
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At the top of the page is a loading view of one of Truax-Traer's 20-yard Euclid units. To the right is shown the extreme right-angle turn—the key to Euclid maneuverability. Above, a bottom-dump unit in action at the tippie. Fast loading, fast hauls, fast dumping . . . the story of Euclid performance.



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Performance*

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There's a lot of work capacity combined with the fuel economy of International's full Diesel engine in the new small TD-6. It has power to operate 8-foot blade graders, 2 to 3-yard hauling scrapers, 6 and 7-foot bulldozers, 7 and 8-foot bullgraders, 1/2 to 3/4-yard rollover scrapers, and other allied equipment of corresponding size.

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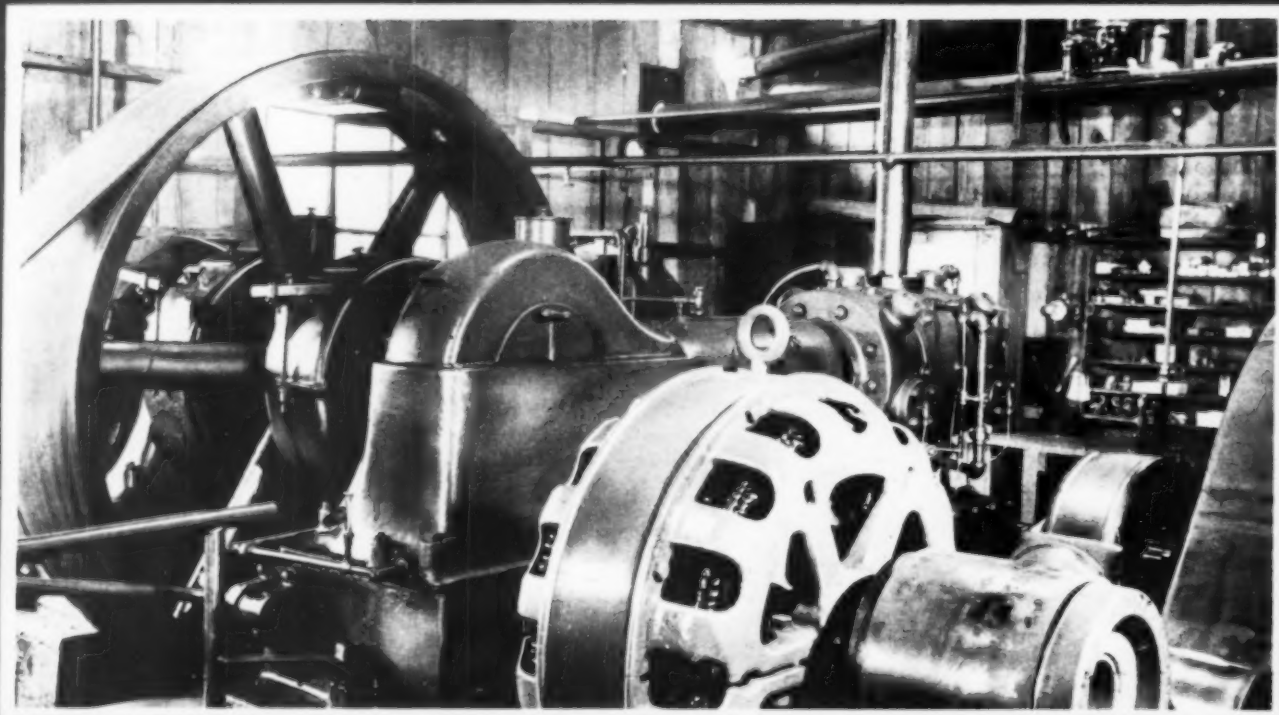
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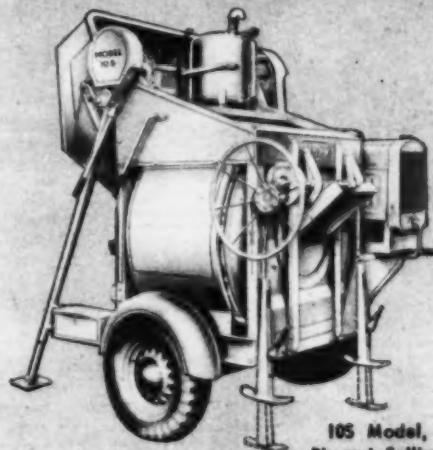
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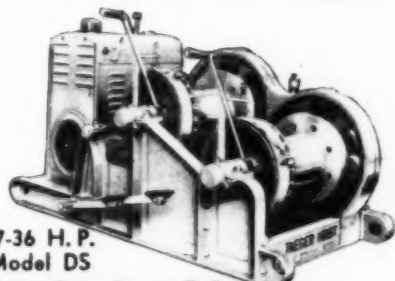
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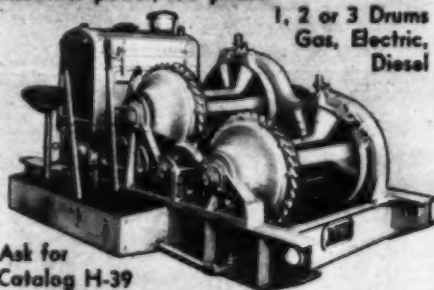
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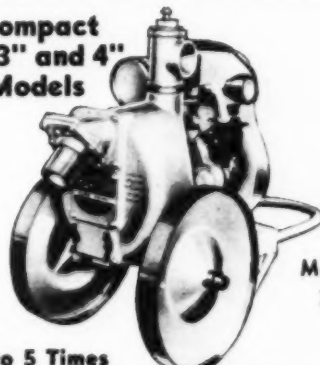
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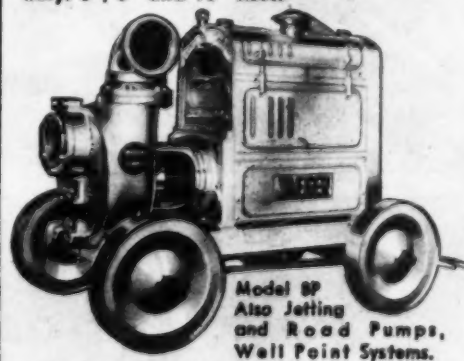


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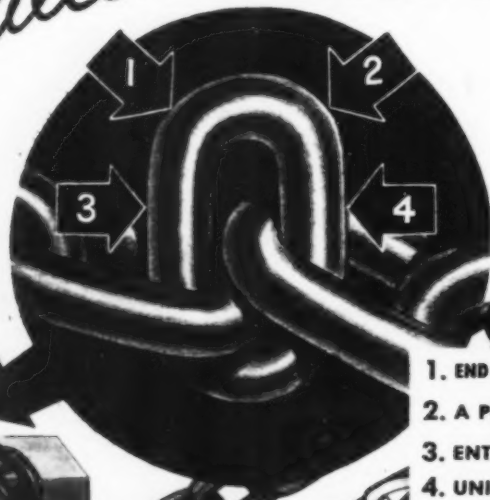
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HEIL DIG-N-CARRY HYDRAULIC SCOOPS



HEIL DIG-N-CARRY MOTOR SCOOPS

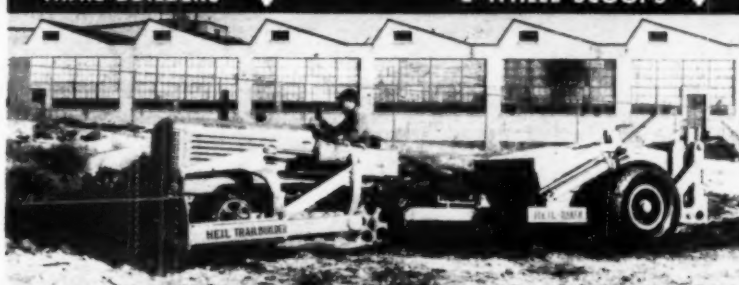


HEIL DIG-N-CARRY CABLE SCOOPS



HEIL HYDRAULIC
TRAIL-BUILDERS

HEIL-BAKER
2-WHEEL SCOOPS



HEIL DIG-N-CARRY TRAILER SCOOPS



HEIL HYDRAULIC DUMP UNITS



Every unit in this complete line of Heil dirt moving machinery is designed and built for **PROFITABLE** operation

— no matter how long the haul or how tough the digging, you will find a type and size of Heil unit to exactly suit your requirements — and give you more yards per day at less cost — Now is the time to investigate — Write, wire or phone **TODAY** for your free copy of the new Heil Road Machinery Catalog — Address:

THE HEIL CO.

MILWAUKEE, WISCONSIN
HILLSIDE, NEW JERSEY

Don't Let Winter Bog Down Your Job



TIME SAVINGS THAT PREVENTED BOG-DOWN ON THIS JOB

STRENGTH

| Specified with Normal Cement | Obtained with Lehigh Early Strength |
|------------------------------------|---|
| 2500 lbs. in 28 days | 4½ days |
| 3000 lbs. in 28 days | 4½ days |

FORM REMOVAL

| | |
|-----------------|--------|
| Columns— 7 days | 3 days |
| Slabs —14 days | 5 days |
| Beams —21 days | 7 days |

LEHIGH
EARLY STRENGTH
CEMENT

TUBERCULOSIS SANATORIUM, Butler, Pa.
CONTRACTOR: Matthew Cummings Co., Boston, Mass.
ARCHITECT: Edw. B. Lee, Pittsburgh, Pa.

"It's all in knowing how"—when difficulties must be overcome. That was demonstrated by Matthew Cummings Company when winter cold and snow came to their job. They were six weeks behind schedule through no fault of their own. But, it didn't faze them. They knew the answer. From past experience on the \$6,000,000 Government Housing Project, So. Boston, Mass., they knew quick service concrete would speed up their construction schedule and make up lost time even in the coldest weather.

They used Lehigh Early Strength Cement for columns, beams, and slabs. The concrete met full strength requirements 23½ days quicker than normal cement, allowed form removal as much as 14 days earlier, eliminated most of the usual heat protection time, and speeded up the whole job. On the cost sheet, all this time saving showed in lower form costs, less heat curing expense, reduced overhead.

Winter or summer, Lehigh Early Strength Cement produces better, denser concrete in a third or a fifth the normal time. Use it now to reduce winter building costs; use it any time for all the savings and quicker completion you get with faster curing concrete.

LEHIGH PORTLAND CEMENT COMPANY

Allentown, Pa., Chicago, Ill., Spokane, Wash.

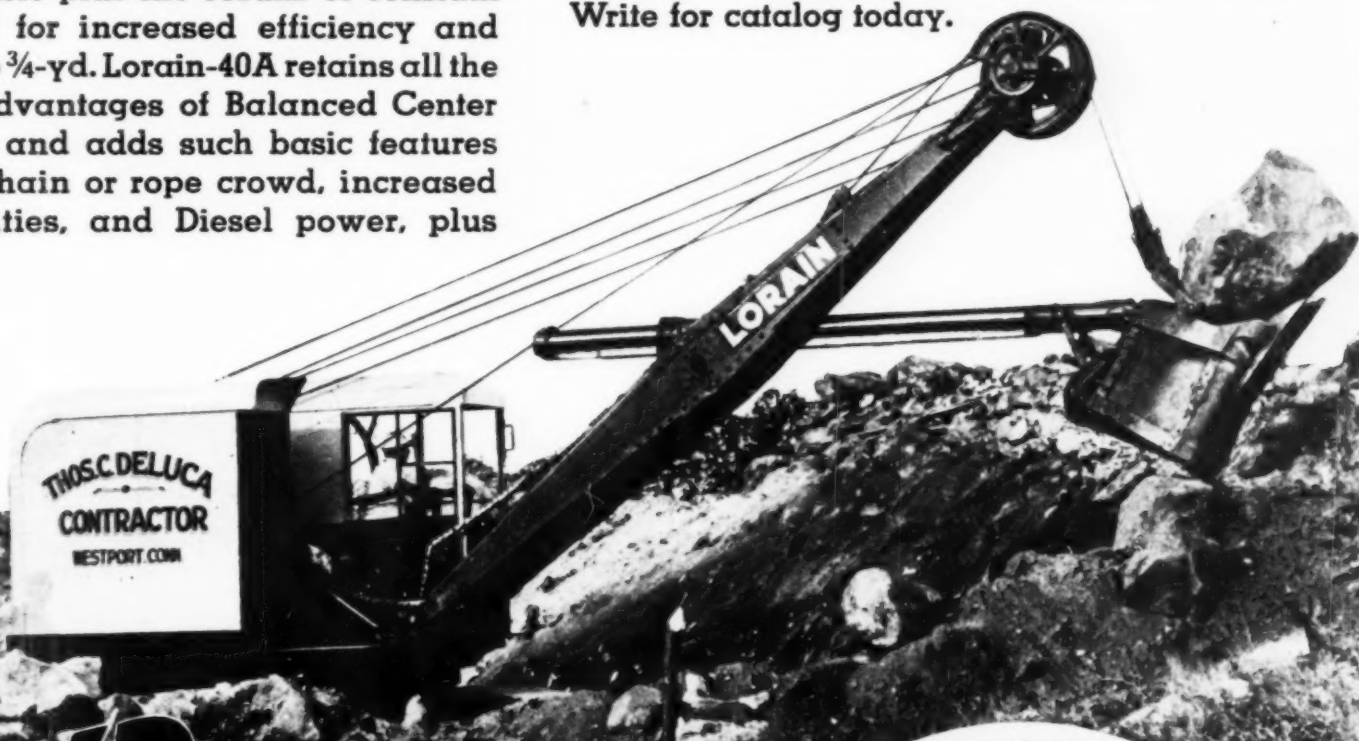
Presenting

the 19"40A" Model of a PROVED 3/4-YD. MACHINE

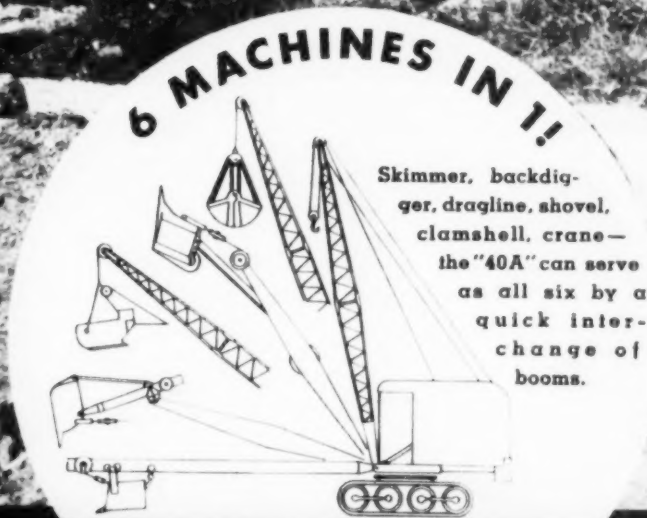
• Here's a shovel with a past and an even greater future. Its past—outstanding performance on hundreds of installations and millions of yards of excavation. Its future—everything that's made this record possible plus the results of constant improvement for increased efficiency and economy. The 3/4-yd. Lorain-40A retains all the time-tested advantages of Balanced Center Drive design and adds such basic features as choice of chain or rope crowd, increased crane capacities, and Diesel power, plus

many minor, but important, refinements too numerous to mention.

And here's a prediction. The Lorain-40A is going to set the design and performance standards for 3/4-yd. shovels and cranes during 1940 as it has in years past. It's ready and rarin' to prove it, too, on your next job. Write for catalog today.



3/4 YD LORAIN 40A



UNIVERSAL CRANE DIVISION • THE THEW SHOVEL COMPANY
LORAIN, OHIO

OUTWORKS ALL TRUCKS

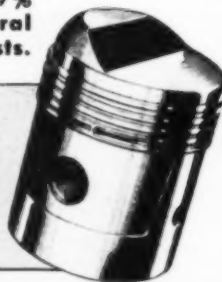


Because GMC SUPER-DUTY ENGINES (in all models) develop more torque per cubic inch of piston displacement, thus producing greater pulling power than other trucks with equal engine displacement and equivalent total gear reduction and tire size . . .

THE TRUCK OF VALUE

For easier handling GMC gives you BALL-BEARING Friction-Free Steering that reduces steering effort as much as 57% according to actual General Motors Proving Ground tests.

POWER-PAK PISTONS IN GMC SUPER-DUTY ENGINES GET MORE POWER OUT OF EVERY DROP OF FUEL!



ONLY GMC GIVES YOU ALL THIS EXTRA VALUE . .

SUPER-DUTY Engines • POWER-PAK Pistons
RIDER-EASE Cabs • QUICK-VISION Instrument Panels • FRICTION-FREE Steering
SEALED-BEAM Headlamps • SYNCRO-MESH Transmissions standard or available in light, medium and heavy capacities.

Our own YMAC Time Payment Plan assures you of lowest available rates

GMC TRUCKS

GASOLINE **DIESEL**

J&L *Precisionbilt*
WIRE ROPE HAS THE
PLUS-VALUE OF CONTROLLED
QUALITY STEEL AND PRECISION
CONSTRUCTION

In J&L Precisionbilt Wire Rope you get all the latest developments and improvements in wire rope construction. You get a product made exclusively of J&L Controlled Quality (CQ) Steel. This means that every process of manufacture, from analysis of ore to the final drawing of rope wire, is under scientific and metallurgical control. You get a product that is exact in its construction because J&L machines were especially designed and built to make wire rope worthy of the name.

Whenever you need wire rope, buy J&L Precisionbilt. There's none better.



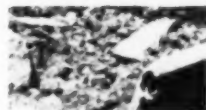
JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

GILMORE WIRE ROPE DIVISION

PITTSBURGH, PENNSYLVANIA

**J&L
STEEL**



"This big tunnel job is going fine with **GULF LUBRICANTS** in service"

... says **GENERAL SUPERINTENDENT ON
PENNSYLVANIA TURNPIKE JOB**

The Arundel Corporation, nationally known contractors of Baltimore, Md., are drilling the Sideling Hill Tunnel, approximately one mile in length, on the Pennsylvania Turnpike. For shovels, trucks, compressors, drills, and miscellaneous equipment Gulf's higher quality lubricants and fuels are used.



Gulf Merit Oil B is used in the line oilers of rock drills on this job, as recommended by an experienced Gulf lubrication engineer.



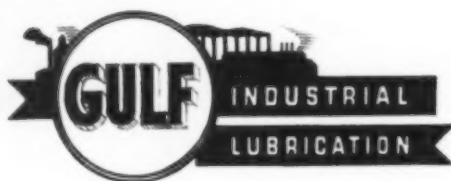
The Gulf engineer cooperates with the power plant engineer to insure safe, dependable lubrication for the large battery of stationary air compressors used on this big job.

*"We follow the **GULF ENGINEER'S** recommendations to the letter"*

"Continuous service from all our equipment is of paramount importance to us on this job," says the general superintendent, "and we're getting it! With Gulf's higher quality lubricants and fuels in service we aren't troubled with operating interruptions or time lost for adjustments or repairs."

You get these three advantages when you use Gulf products: First, an experienced Gulf engineer recommends—on the job—the proper oils and greases for each requirement. Second, you're *sure* of getting lubricants exactly suited to your equipment—because the Gulf line includes several hundred different brands of oil and greases. Third, Gulf's wide distribution, through 1100 warehouses from Maine to Texas insures *prompt* delivery, no matter how remote the job.

Call in the Gulf engineer *now* and get the benefits of Gulf's higher quality lubricants and fuels. He can help you finish your job with a *bigger profit*.



**GULF OIL CORPORATION
GULF REFINING COMPANY**
Gulf Building, Pittsburgh, Pa.

For Bigger Earnings



LAPLANT-CHOATE CARRIMOR SCRAPER

★ *Saves Time . . .
Cuts Costs
Increases Output*

CARRIMOR
*the Smash Hit
of the
Road Show!*

QUICKER, easier loading . . . faster, cleaner dumping . . . time-saving mobility are proven features of this big LaPlant-Choate Carrimor scraper that step up your production and slash operating costs. Here's a scraper that has demonstrated its ability to haul equal loads up grades and through soft dumps in one to three gears faster.

Advanced designing and engineering; thorough, rigid field-testing assure maximum value in every detail. A narrow cutting bit and flat loading bowl substantially reduce loading resistance. Greater ground clearance assures added mobility in soft and rough places. Lower center of gravity prevents tipping. Close coupled design and shorter turning radius give you outstanding flexibility. LaPlant-Choate Carrimor is a positive ejection type scraper with no obstructions in the bowl . . . hence it dumps sticky materials instantly where other scrapers lose minutes trying to dump.

Avoid scraping, hauling and dumping worries. Investigate LaPlant-Choate Carrimor scrapers today. Available in 3 sizes — 8.6 yds. struck . . . 11 yds. heaped; 13.6 yds. struck . . . 17 heaped; and 22 yds. struck . . . 29 heaped. Designed exclusively for use with "Caterpillar" Track-type Tractors. Write for Free literature or ask your LaPlant-Choate and "Caterpillar" dealer for full details.

**BULLDOZERS
LAND CLEARING TOOLS
SNOW PLOWS
RIPPERS**

LA PLANT-CHOATE
MANUFACTURING CO. Inc.
CEDAR RAPIDS, IOWA.

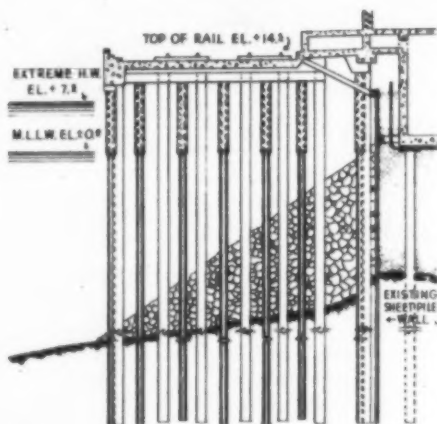
**SCRAPERS
TRAIL BUILDERS
BRUSH CUTTERS
TAMPING ROLLERS
TREEDOZERS**

H-PILES *simplify a Tough Job* OF WHARF UNDERPINNING!



GENERAL VIEW OF OPERATIONS showing cored holes on dock through which U·S·S Steel Bearing Piles were driven. In the background, note contractors driving equipment mounting Vulcan No. 0 hammer. Gantry crane in foreground, part of permanent plant equipment, was utilized for moving steel to driving rig. Piles averaged 75 ft. in length—this length was obtained by weld-splicing shorter sections in the field.

Consulting Engineers: White & Squire, San Francisco. General Contractors: Tavares Construction Co., Los Angeles



*Over 40,000 lin. ft.
of U·S·S Steel Bearing Piles provide
safe, fast and economical
foundation . . .*

FOUNDATION engineers will find this wharf reconstruction for the Ford Motor Company plant at Long Beach, Calif., worth careful study.

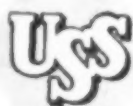
How to reinforce the wharf and foundations for adjacent plant structures, menaced by the serious disintegration of the original material—and how to provide a strong, lasting and shock-resistant foundation without tying up plant and wharf facilities—were problems that called for unusual engineering skill and ingenuity.

The photographs and diagrams shown here illustrate how this job was handled—and completed to predetermined schedules without hitch or hold-up.

The U·S·S Steel Bearing Piles used in this underpinning (CBP-124 and CBP-103, weighing 74 lbs. and 57 lbs. per lineal foot respectively) averaged 75 feet in length, were driven with average penetration of from 40 to 50 feet, give estimated load-bearing value approximately 50 tons per pile. Many of these piles were driven through 25 feet of rock rip rap, without the use of driving points, and with no unusual difficulties.

Highly important was the relatively small size of these steel H-pile sections. Their small displacement permitted driving without any disturbance in the existing structure and made unnecessary the expense and trouble of removing the existing piles. On the wharf proper, holes were cored through the 3-foot thick concrete floor and through these the H-piles were driven. In all, 556 H-piles were driven on this project—total supported area 50,650 sq. ft. approx.

We are proud to add this interesting job to the long list of successful foundation structures in which U·S·S Steel Bearing Piles have proved their efficiency and economy. More than 4 million feet of these versatile wide-flange CBP Sections, especially designed for heavy pile use, have been driven in the past 4 years. We believe it will pay you to investigate them for your projects—especially when conditions are unusual.



STEEL BEARING PILES

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York

UNITED STATES STEEL

Four more makes seven NORTHWESTS

for
B. PERINI & SONS
Framingham, Mass.

EVERY contractor in New England knows B. Perini and Sons, Inc. of Framingham, Mass. They know he has tried several makes of shovels. They know he has put his shovels through some m-i-g-h-t-y tough rock—boom straining, stick straining, dipper straining rock that takes the heart out of ordinary machinery.

It is significant then that the last four machines, all purchased this year by B. Perini and Sons, Inc. are Northwest Shovels. *Remember*—repeat orders are based on service rendered! Good service, money making service has made Northwest the repeat order machine. You want to make money too.

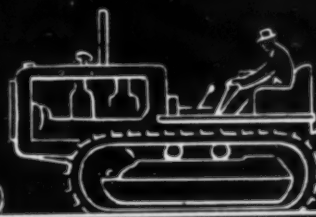
NORTHWEST ENGINEERING CO.
1728 Steger Bldg.
28 E. Jackson Blvd.
Chicago, Ill.

Built
in a range
of 18 SIZES
3/8 yd. capacity
and
Larger

DUAL CROWD!
INDEPENDENT
PLUS AUTOMATIC
Digging
Power
Plus

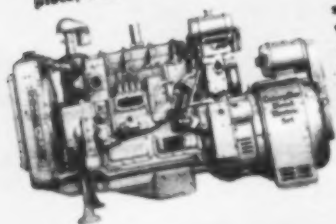
*If it's a real
Rock Shovel
you won't
have to worry
about tough
going*

15,000 CUBIC YARDS EVERY 24 HOURS



MAKE YOUR OWN LIGHT AND POWER FOR LESS THAN "CITY RATES"

These small, low-priced "Caterpillar" Diesel-Electric Sets—compact, complete, easy-to-install packages—can supply electric current for less than 1¢ per kw. hr.... depending on their average loads and the local cost of Diesel fuel. No switchboard, automatic voltage-regulator, or other external control apparatus needed. Simply set them up and start them up. Completely self-regulating. Available in 13, 15, 20 and 30 kw. Talk to your "Caterpillar" dealer about using this new source of low-cost power for your camps and jobs.



CATER

DIESEL ENGINES • T

At the Evansville Levee Project, A. G. Ryan & Sons have two borrow-pits. Here are three of the four "Caterpillar" Diesel D8 Tractor-LeTourneau Carryall Scraper outfits rolling in from one of the pits with their heaping payloads.



Production and dependability—both are outstanding in the reports about "Caterpillar" Diesel Equipment from the Evansville (Indiana) Levee Project. And both are important news to men who earn their living by moving dirt!

A. G. Ryan & Sons have ten "Caterpillar" Diesel D8 Tractors and one "Caterpillar" Diesel D6 Tractor on the job. They're handling three Athey bottom-dump wagons and four LeTourneau Carryall Scrapers—as well as sheepfoot tampers to compact the fill.

It's a 100% "Caterpillar" Diesel-powered job!* And the work is roaring along in typical 100% "Caterpillar" Diesel fashion! Night and day—without stopping except for fuel and lubrication—the Ryans haul their heaping payloads . . . and reduce the 1,200,000-cubic-yard contract by 15,000 yards every 24 hours!

It takes tough, well-built equipment to move such loads at such a pace. And "Caterpillar" Diesel Tractors are once again proving themselves *exactly that!*

CATERPILLAR TRACTOR CO., PEORIA, ILL.

* Trimming and finishing the slopes of the levee are also done by "Caterpillar" Diesel Power—a "Caterpillar" Diesel No. 12 Motor Grader.

Here, at the other borrow-pit, a "Caterpillar" Diesel D8 Tractor and an Athey bottom-dump wagon, one of three such units on the job, gets its load from a drag-line. The ability of these units to conquer soft going has substantially slashed the length of haul the Ryans originally thought would be necessary.



CATERPILLAR

REG. U.S. PAT. OFF.

• TRACK-TYPE TRACTORS • ROAD MACHINERY

AN OPEN LETTER...



HAZARD WIRE ROPE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

WILKES BARRE, PA.

DISTRICT OFFICES
NEW YORK
PHILADELPHIA
PITTSBURGH
ATLANTA
BIRMINGHAM
LOS ANGELES

GENERAL OFFICE
AND WORKS
WILKES BARRE, PA.

DISTRICT OFFICES
BOSTON
CHICAGO
CINCINNATI
DENVER
DETROIT
INDIANAPOLIS
KANSAS CITY
MINNEAPOLIS
NEW ORLEANS
SAN FRANCISCO
ST. LOUIS
WASHINGTON, D.C.

To Wire Rope Users:

If there be one thing in which we have more pride than in our product—it is our customers.

Their faith in Hazard Wire Rope—their confidence in Hazard counsel—their belief that Hazard prices are fair and assure obtaining more than average service return for their money—continuously spur our organization to develop an even finer wire rope rather than to produce the greatest volume.

We do not make as much wire rope as some manufacturers. What we make we try to make well. That some customers have bought Hazard Wire Rope for 30 years—40 years—even 50 years—encourages us to hope that we have not labored in vain.

To merit such loyalty is our purpose for today and the future as it has been in the past.

In saying this, we believe we speak for every member of our organization.

G. Brown
Vice President



HAZARD LAY-SET

Preformed

PURCHASE ORDER
BATES & ROGERS CONSTRUCTION CORP.
CHICAGO • ILLINOIS
From THE MARION STEAM SHOVEL CO., MARION, OHIO, U.S.A.

BIL MARION

SINCE 1923

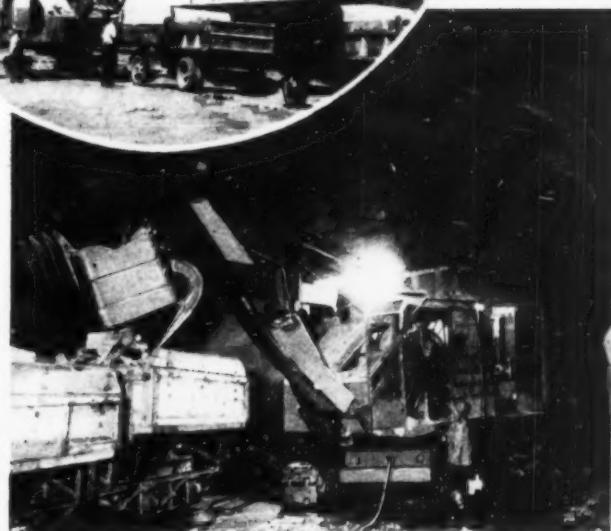
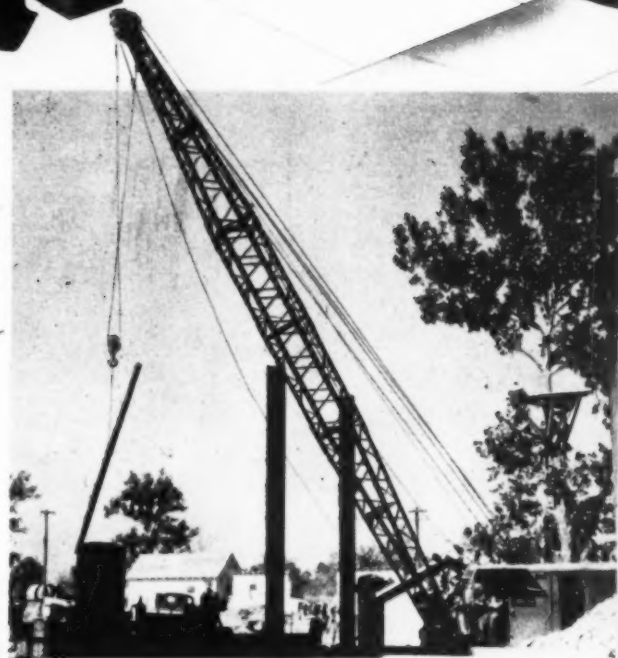
For
**COAST to COAST
SERVICE**

From the Oakland Bay Bridge in San Francisco to The Pennsylvania Turnpike is the working itinerary of MARION shovels, draglines and tunnel shovels owned by Bates & Rogers Construction Corporation, Chicago, Ill. • This prominent contracting concern bought its first MARION in 1923. Four of the 13 MARIONS owned by this company were purchased in 1939. Two of them are MARION 3/4 cu. yd. shovels. The other two are 1-1/2 cu. yd. tunnel shovels especially designed for tunneling through rock on the Pennsylvania Turnpike. When a contractor like Bates & Rogers Construction Corporation reorders again and again — you know MARIONS have what it takes to clean up contracts in record time. There is a MARION for your material handling job — from 3/4 cu. yd.

THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.

MARION

**SHOVELS • DRAGLINES • CLAMSHELLS
CRANES • PULL-SHOVELS • WALKERS**



OLD-TIME REPAIR MAN AMAZED AT ISO-VIS RECORD

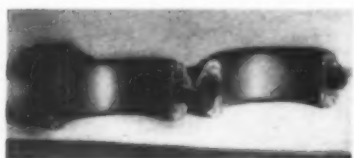
● It's SOMETHING of a job to amaze the foreman of a central state ambulance garage who's been around automobiles since 1906, but he admits it himself:

"I am writing regarding what I think is an amazing performance of one of the ambulances under my care and your Iso-Vis Motor Oil."

When the car that he speaks of was taken down after 193,000 miles of operation on Iso-Vis, here are some of the figures revealed. Not one bearing, ring or piston had been replaced in that time, and the pistons were good enough to use



Pistons and connecting rod bearings taken from the ambulance engine after 193,000 miles of operation on Iso-Vis. The pistons were used again.



A .0015 shim was taken out of the connecting rod bearing, and main bearings were not changed.

again. The point of greatest wear on cylinders was less than .0025 oversize. A .0015 shim was taken out of the rod bearings and the main bearings were not touched.

A good product alone cannot duplicate this performance. It takes good maintenance practice as well. That's the reason for Standard Automotive Engineering Service. When you use this Service and Standard Oil fuels and lubricants you have a record-making combination.



C. B. Custer, Automotive Engineer at Davenport, checks combustion, operating temperatures, and ignition efficiency on a Rieke Lines truck. Overall efficiency was increased as much as 20% on some units in this fleet.



Jack Nelson, Des Moines Automotive Engineer, checks performance of one of Thorpe Well Co.'s Diesels.

CONTRACTOR FINDS STARTLING ECONOMIES

"We were not aware of the startling efficiency losses in our equipment until your Engineer brought them to our attention." That opinion from W. T. Thorpe of the Thorpe Well Company, Des Moines, summarizes the experience of practically every user of Standard Automotive Engineering Service.

Mr. Thorpe operates gasoline and Diesel powered well-drilling equipment throughout the Middle West.

"This service," he continues, "enables me to save as much as 100 gallons of fuel a day with all units operating."

There you have the whole story of Standard Automotive Engineering Service. These engineers help you make your equipment more efficient. You collect in lower fuel and maintenance bills. What's more, this service costs you nothing.

TRUCK OPERATOR BOOSTS STANDARD'S ENGINEERING SERVICE

"Your Automotive Engineering Service as rendered by your Mr. C. B. Custer can definitely be recognized as a factor in decreasing operating costs of our fleet."

H. W. Rieke, manager of the Rieke Lines, who gives this boost to Mr. Custer and his work, did not say he liked Mr. Custer's eyes or his poker-playing. He did say Mr. Custer definitely reduced operating costs.

There are engineers just like Mr. Custer located throughout the Middle West. One of them is waiting for you to call. In the meantime he is showing fleet operators around you how they can get all that they pay for in the gasoline, motor oils or lubricants they must buy.

Just phone your local Standard Oil (Indiana) office and ask to have an Automotive Engineer call on you. Or write 910 South Michigan Avenue, Chicago, Illinois.

STANDARD OIL COMPANY (INDIANA)

AUTOMOTIVE ENGINEERING SERVICE

LOWERS
MILEAGE
COSTS

COULD YOU AFFORD THE

Gift



...OF ANY OTHER SCRAPER?

This contractor *proved* to himself conclusively that this LeTourneau "RU" Carryall Scraper had an extra earning capacity to the tune of \$58,000 over the nearest competitor! Actual comparative demonstrations on a section of the Pittsburgh, Pa., Housing Project bear this out:

Though a "like-capacity" scraper made trip for trip with the LeTourneau "RU" ... fullest capacity loads in both scrapers,

weighed on the job, showed the "RU" Carryall delivering 22.12 *pay* yards (79,400 lbs. net dirt weight) as against the competitor's 16.94 yards (60,800 lbs. net dirt weight) ... or 5.18 more *pay* yards of clay-like shale handled the LeTourneau way for the same D8 tractor horsepower!

For one thing, this indicates the loading ease of LeTourneau Carryalls. Then, consider the added life of LeTourneau double bottoms to lengthen equipment life ... plenty of tires engineered to the equipment, so they're rarely overloaded ... positive ejection that gives controlled spread of all materials—winter

or summer.

But, back to the demonstration ... with both machines averaging 2300-foot cycles in 10.5 minutes ... or 41 loads each seven-hour shift ... the LeTourneau Carryall moves 29 more yards per hour ... 205 more pay yards each seven-hour shift ... with extra LeTourneau profit figuring out like this: In 10,000 hours—accepted construction equipment life—the LeTourneau Carryall would account for 290,000 more yards ... or figured at 20¢ a yard, would earn \$58,000 over the nearest competitor.

Thus, we ask ... could *you* afford the *gift* of any other scraper? Ask your LeTourneau and "Caterpillar" dealer or write R. G. LeTOURNEAU, INC., Peoria, Ill., Stockton, Calif.

It's THE "WEIGH" THAT PAYS



... DEMAND A DEMONSTRATION

LETOURNEAU

CARRYALL* SCRAPERS

ANGLEDZERS*, BULLDOZERS, ROOTERS*, POWER CONTROL UNITS, DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, CRANES, TREEDOZERS.

*Name Reg. U. S. Pat. Off.

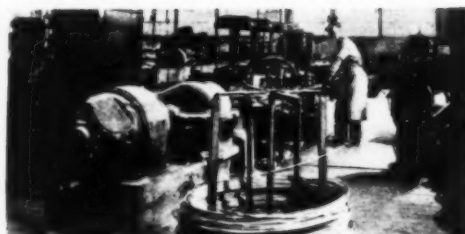


**"Sure I Can Prove Wire Ropes
Are NOT All Alike! Look...!"**

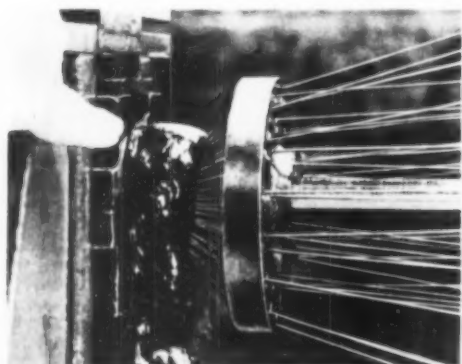


Macwhyte Salesman: It's true, Mr. Buyer, that wire ropes LOOK alike. But you don't buy LOOKS, you want PERFORMANCE. So let me take you behind the scenes and find out what performance is made of...

Mac: You'll find, in making steel, few companies use exactly the same kind of ore, or the same method of smelting. In heat treating (above) and in baking, temperatures vary, too. From the very beginning wire ropes are made differently. Then...



Mac: You'll discover also that few manufacturers have exactly the same specifications for making wire ropes. Few use identical dies for wire drawing (above), probably none of them use the exact number of drafts...



Mac: You'll learn that the way a rope is "closed" and lubricated (above) makes a lot of difference in performance. Few companies use the same procedures, or the same lubrication...



Mac: So, from just a few operations, you can see why wire ropes actually are very different. After years of experience and laboratory research we've produced our own formula for making better wire rope. Ask any user... he'll tell you Macwhyte gives performance second to none.

BUY MACWHYTE AND GET ALL 3!

1 Laboratory tested, field proved wire rope ... made from the finest steels, made for the specific job. Field proved on countless jobs.

2 PREformed ... to give you much longer service, and lower your wire rope costs.

3 With THE Internal Lubrication ... a special Macwhyte lubricant that covers EVERY WIRE and strand, gives REAL protection where it's needed most: against internal friction and corrosion.

NO. 445 #



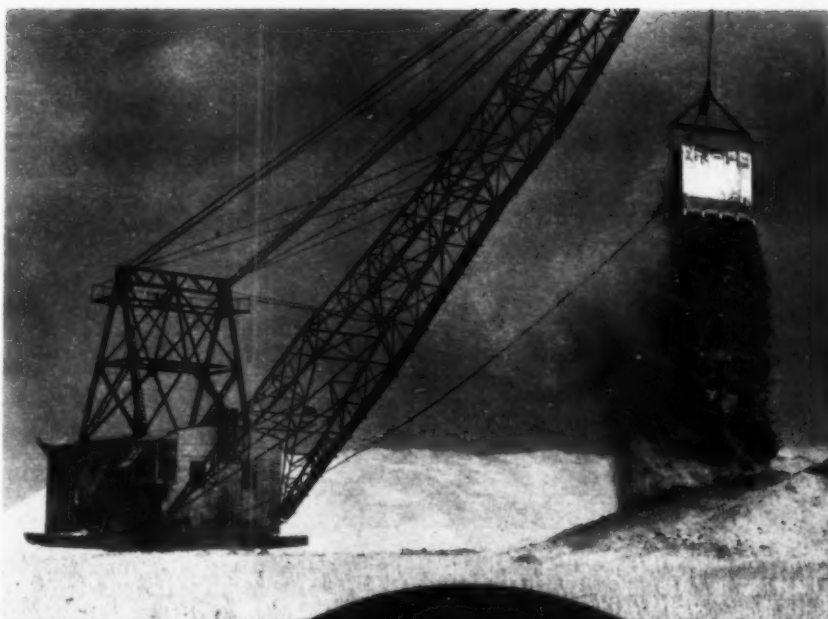
MACWHYTE COMPANY, Keshena, Wis. Manufacturers of Wire Ropes and Braided Wire Rope Slings for every use. (Distributors throughout the U. S. A.) New York ... Pittsburgh ... Chicago ... Ft. Worth ... Portland ... Seattle ... San Francisco

GENERAL CATALOG listing over 1000 ropes with information on ordering, care, and the use of wire rope, available on request.

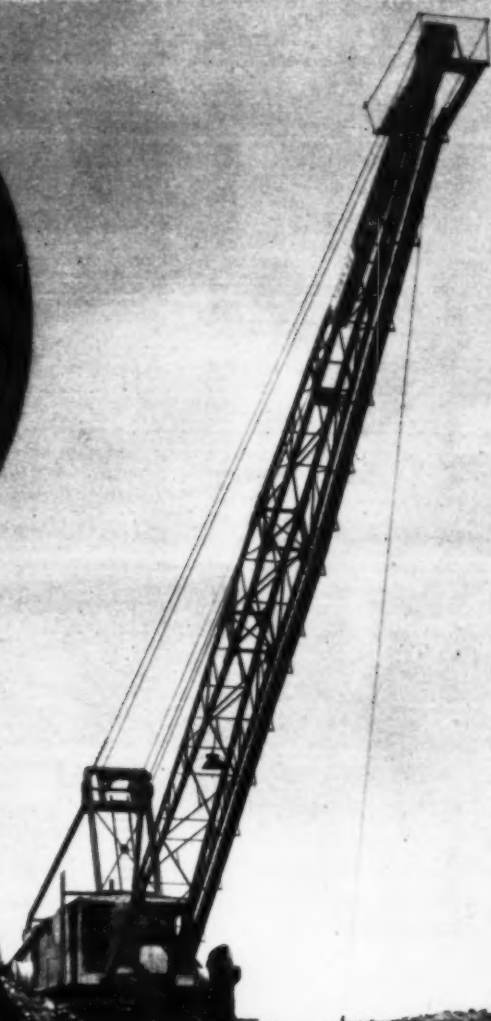
**LABORATORY
TESTED
FIELD PROVED**

PLUS INTERNAL LUBRICATION

MACWHYTE
Whyte Strand
PREformed
WIRE ROPE



Digging canals; building levees and dams; stripping gold, tin and coal — these are only a few of the jobs Bucyrus-Monighan walking draglines have handled all over the world. For 27 years these machines have been "walking their way to success" on soft footing and over rough ground. Leading dirt-movers today choose Bucyrus-Monighans for the long-range big-output jobs because these machines have thoroughly proven their ability to deliver outstanding performance.



**BUCYRUS
MONIGHAN**

Sold by

Bucyrus · Erie

S O U T H M I L W A U K E E , W I S C O N S I N

Jobs Run Smoother with **BAKERS**



ABOVE. Model 306A Baker Hydraulic Bulldozer on a quarry stripping job. Stamina and smooth hydraulic control make easy work of a usually difficult job.

BELOW. One of the smaller models of Baker Hydraulic Scrapers excavating a 28 x 50 ft. basement in less than six hours.

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SCRAPERS — Because of their flat digging angle, Baker Hydraulic Scrapers fill to capacity with far less power, operate more economically and do a cleaner job. The digging angle is constant, regardless of the depth of cut — no gouging or unsightly holes. You can get Bakers in sizes for any tractor of 25 horse power up. There's a model for your tractor.

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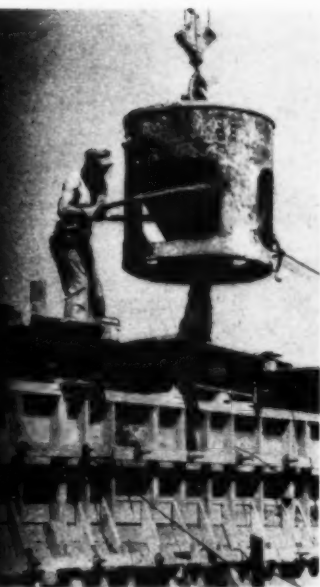
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BULLDOZERS • GRADEBUILDERS • SCRAPERS • ROOTERS • ROAD DISCS • MAINTAINERS • SNOW PLOWS

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BLAW-KNOX Concrete Bucket
operate so easily?

Why—the discharge gate
is a rubber pad running
on roller bearing rollers.

HM—Pretty Slick!
no other Bucket
like it.



- Controllable discharge, Blaw-Knox CONCRETE BUCKETS are a popular concrete placing unit. Used by contractors everywhere. Send for a copy of the catalog on Blaw-Knox Concrete Buckets, No. 1586.

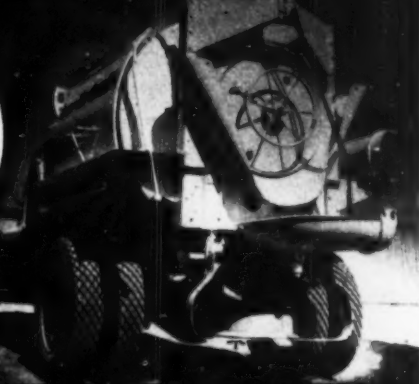
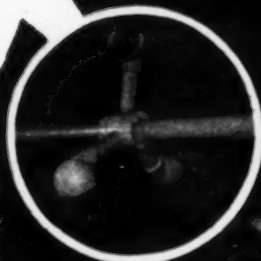
BLAW-KNOX DIVISION of Blaw-Knox Company
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BLAW-KNOX *Roller Gate* CONCRETE BUCKETS

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"MAN... That new WATER IMPELLER in
BLAW-KNOX TRUKMIXERS puts water into the
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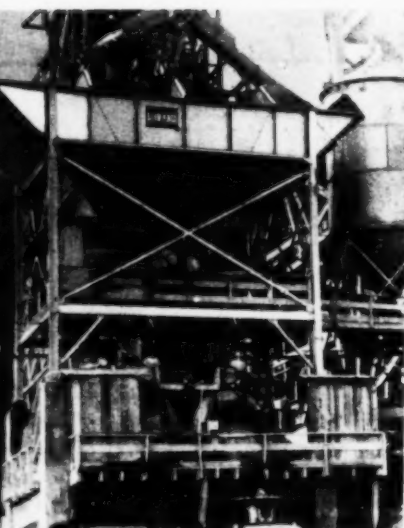
The new, fast water impeller that won't clog, an accurate and dependable water measuring system, superb mixing action—and assurance of dependable continuous operation make Blaw-Knox Trukmixers the popular choice, and the practical buy for you. Study these features before you decide.



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Catalog 1582

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OF BLAW-KNOX CO.
FARMERS BANK BLDG. · PITTSBURGH, PA.
Agitators and **TRUKMIXERS**

"We don't worry
about concrete,
we have a
BLAW-KNOX
CENTRAL MIXING
PLANT on the job!"



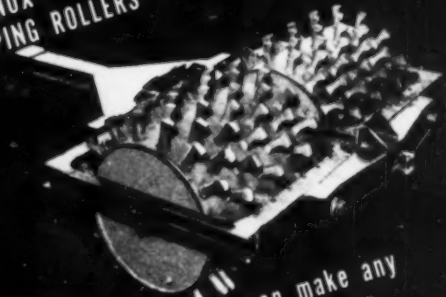
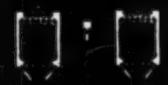
Engineering advice, based on sound experience, is offered as a part of Blaw-Knox service in the design and arrangement of a central mixing plant for your job.

Stationary or floating plants, manual or automatic in operation, have been furnished on hundreds of jobs. Many of them are illustrated in Blaw-Knox Catalog No. 1566.

BLAW-KNOX DIVISION of Blaw-Knox Company
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BLAW-KNOX *Central Mixing Plants*

"I like this convertible
idea on BLAW-KNOX
TAMPING ROLLERS"



"You can make any
arrangement or
combination you want"

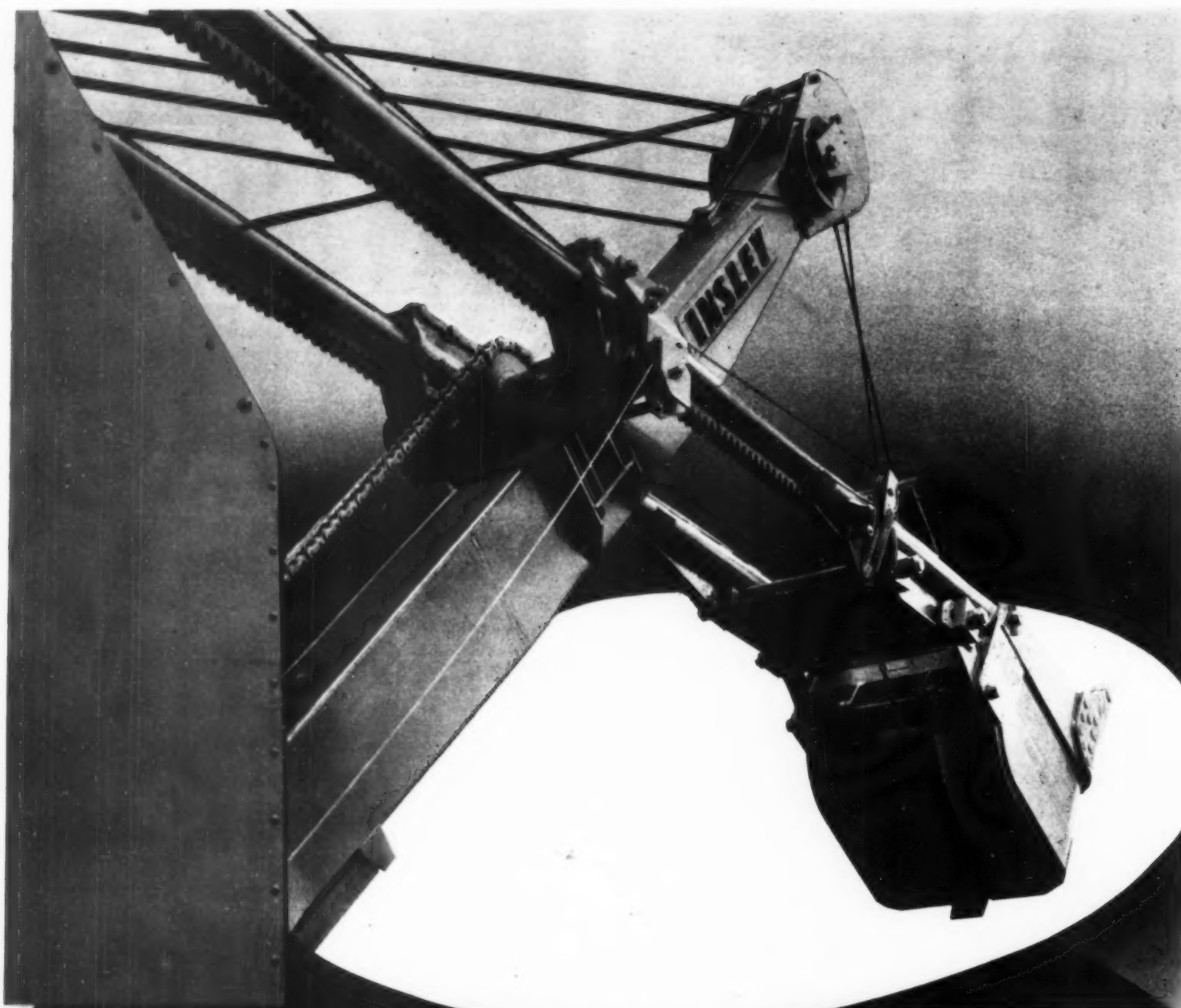
For compacting earth fills—the practical design of Blaw-Knox Sheepfoot TAMPING ROLLERS appeals to contractors because they give uninterrupted service and meet all modern specification requirements.

The roller units are full floating, on husky frames—built for long, hard use.

Send for complete details and prices.

BLAW-KNOX DIVISION of Blaw-Knox Company
FARMER'S BANK BUILDING PITTSBURGH, PENNA.

BLAW-KNOX *Sheepsfoot* TAMPING ROLLERS



the Improved **INSLEY** *type K*

The Improved Insley Type "K" is, by far, the best machine we have ever built. As the product of the Pioneer Builders of Smaller Excavators, the Insley Type "K" Excavators and Cranes have always been the outstanding machines in the industry. Note the many advantageous features . . . see it at the A. R. B. A. Road Show.

INSLEY MANUFACTURING CORPORATION, INDIANAPOLIS, IND.

THE INSLEY HK 1/2-YARD EXCAVATOR

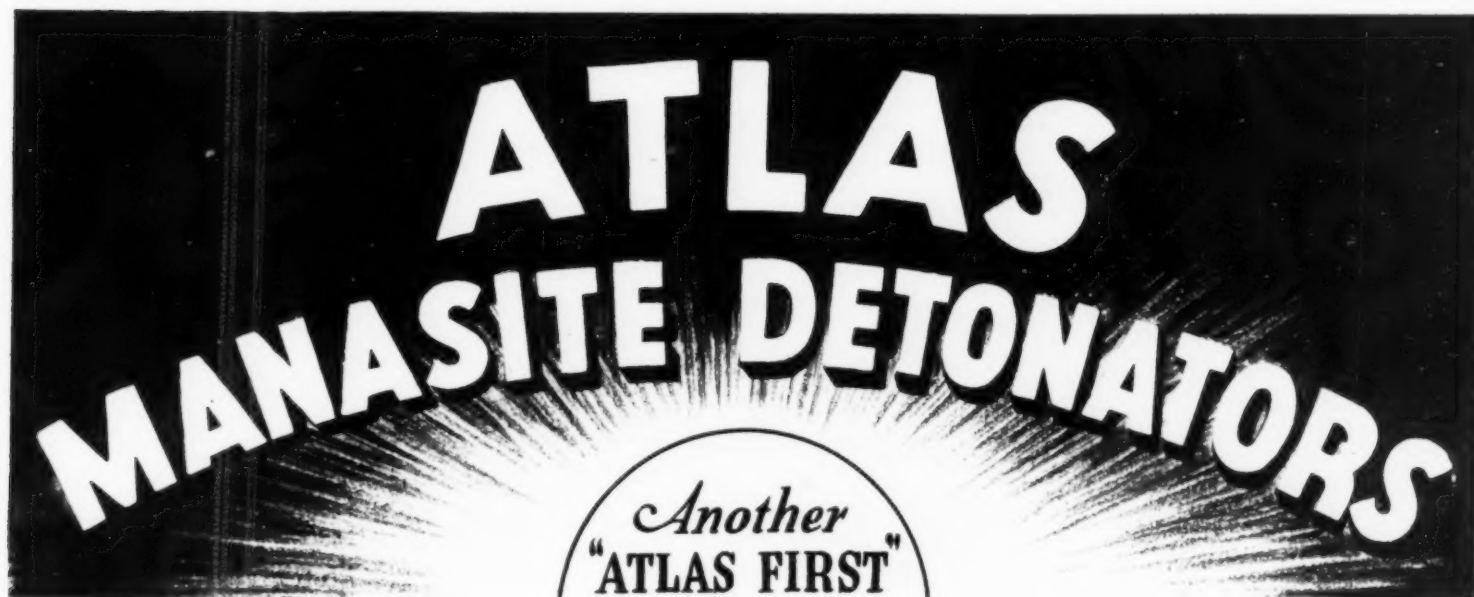
This improved heavy-duty shovel, shown for the first time at the A.R.B.A. Show, includes many features that assure more paying yardage at a lower yardage cost than most machines of larger rated capacity.

Before investing in a new shovel, be sure you look at this outstanding machine, which boasts such big shovel features as independent chain crowd, reversible two-speed front drum, fully enclosed gears running in oil, temperature-controlled cab. Get the complete story. Write for Bulletin #146. Insley Manufacturing Corporation, Indianapolis, Indiana.

FIFTY MILLION SHOTS CAN'T BE WRONG

The figures tell the story—over 50,000,000 Atlas Manasite Detonators already have been used. Blasters start using Atlas Manasite caps for the extra margin of safety—and keep on using them because the safety feature is combined with complete *dependability* in action.

Through decreased sensitivity to impact and friction, Atlas Manasite Detonators make safety precautions more effective—at no increase in price. No wonder they have been accepted as a great step forward in making blasting safer.



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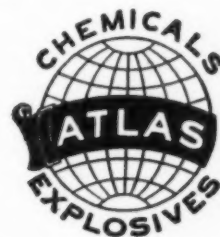
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ATLAS

EXPLOSIVES



TIME FOR CONCRETING CUT 29%



Saved

24 days in winter concreting
24 hours per floor in protection
1 complete set of forms

Skyscraper home for 700 students at Northwestern University, Chicago, being rushed to completion with Atlas High-Early cement. Universal portland cement used on first three floors. Shift to Atlas High-Early cement has, so far saved 4 days per floor. Architect, James Gamble Rogers, New York; General Contractor, R. C. Wieboldt Co., Chicago.

... ALL WITH ATLAS HIGH-EARLY CEMENT

CONCRETING had been completed on but 3 stories of Northwestern University's new dormitory when cold weather set in. Winter construction plus necessity of completing this 18-story building on schedule prompted R. C. Wieboldt Co., the contractor, to shift from Universal standard portland cement to Atlas High-Early cement for the remaining 15 floors. Did it pay? What were the results?

Cylinder tests showed that the concrete attained over 2000 lb. strength in 3 days and over 3000 lb. in 7 days, as required. So forms were stripped in 10 days instead of 14—a saving of 4 days per floor, or 24 days in constructing floors 4 to 9 inclusive. Therefore, time for concreting was cut 29% with Atlas High-Early cement. In addition, time required for protection and curing was reduced from 48 to 24 hours, and costs

were cut as well. There were savings in form costs, too. Two complete sets of forms instead of 3 are doing the job. And plans call for continuing the construction with Atlas High-Early cement.

Consider Atlas High-Early cement on your next job. It saves time and promotes more economical construction on many jobs. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, New York.

Atlas High-Early Cement

A UNIVERSAL ATLAS PRODUCT



CM-H-5

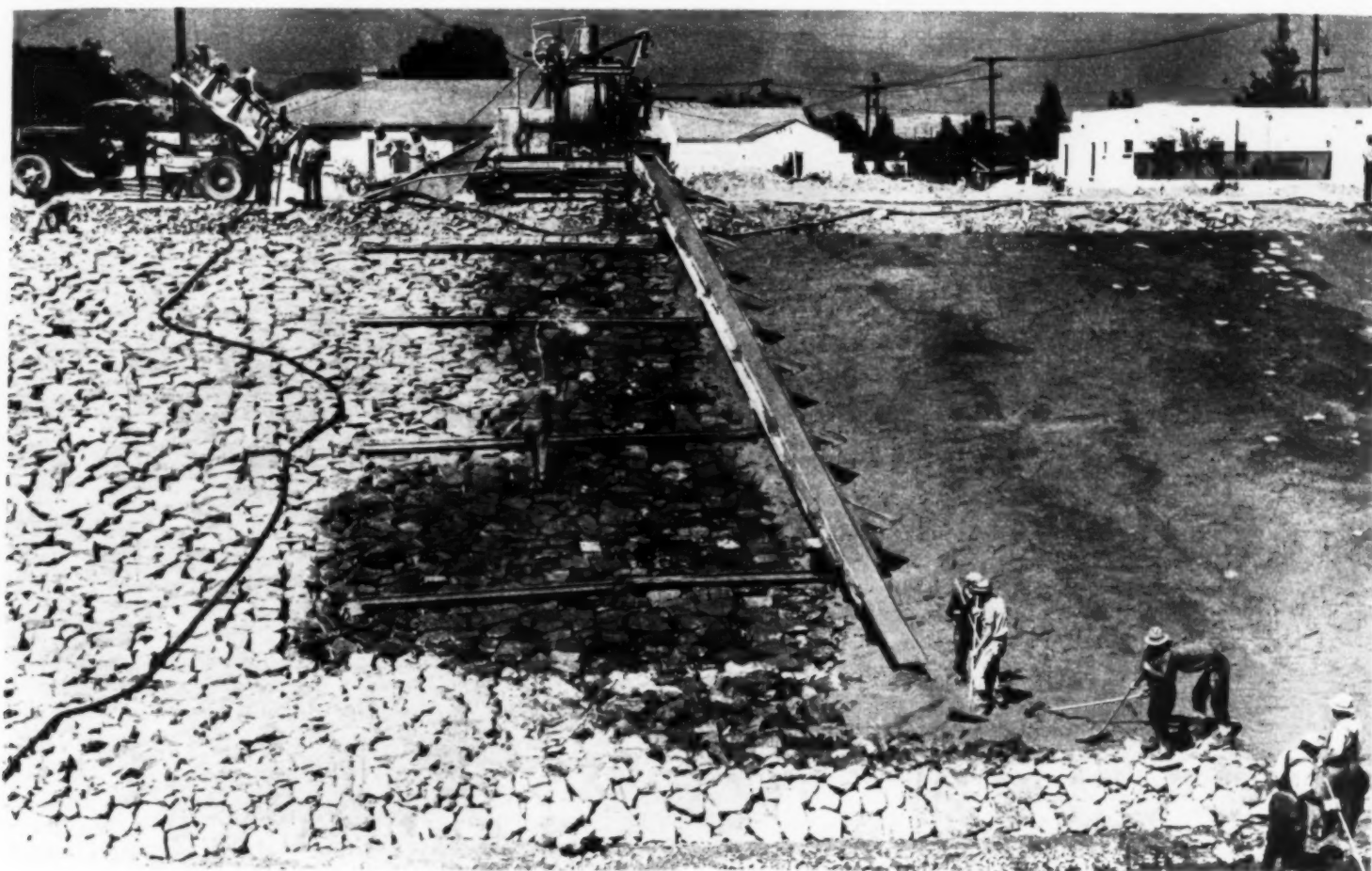
Construction Methods

ROBERT K. TOMLIN, Editor

Volume 22

FEBRUARY, 1940

Number 2

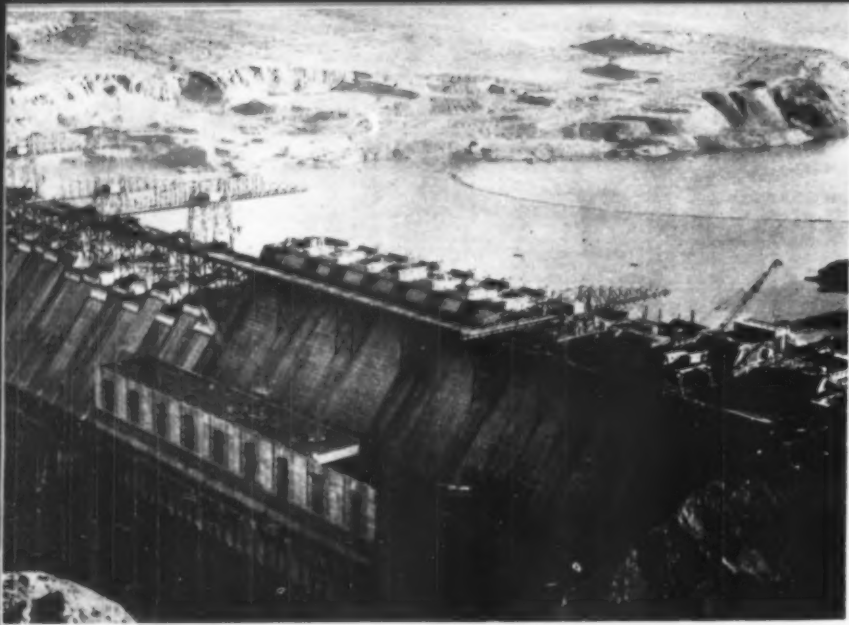


TRAVELING AS UNIT, mixer and rolling chute supply mortar to grouting crew on bank paving of Los Angeles River.

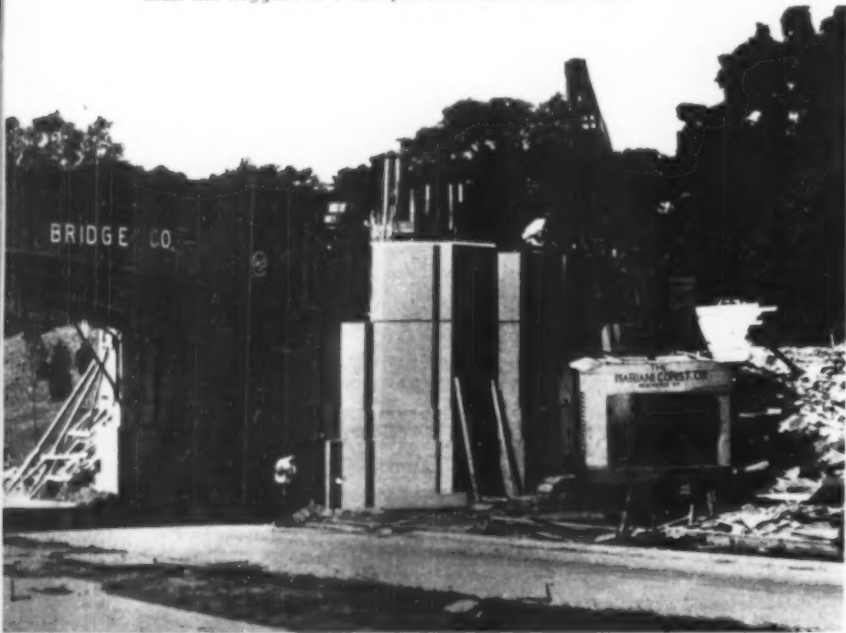
Rolling Plant
**GROUTS
PAVED SLOPES**

GROUTING OF ROCK-PAVED CHANNEL BANKS and toe trench is accomplished in one operation by U. S. Engineer Department forces making flood control improvements in the Los Angeles River between Glendale and Los Angeles, Calif. Paving stone is hand-laid over a layer of spalls and is thoroughly wet before grouting. A chute from the mixer, supported on pneumatic tires which run on wooden guides, is moved ahead by hand with the mixer. Grouting starts at the top of a section and proceeds down the slope by diverting the grout through side spouts, spreading and working it into the voids with stiff brushes.

Need for grouting the rock was demonstrated during the flood of March 2, 1938, when similar, but ungrouted, paving was damaged by the swift flowing flood waters. The work shown is with hired labor and government-owned or rented equipment. The chute was designed and built by U. S. Engineer Department employees. Major Theodore Wyman, Jr., is district engineer in charge of Federal flood control work in the Los Angeles District.



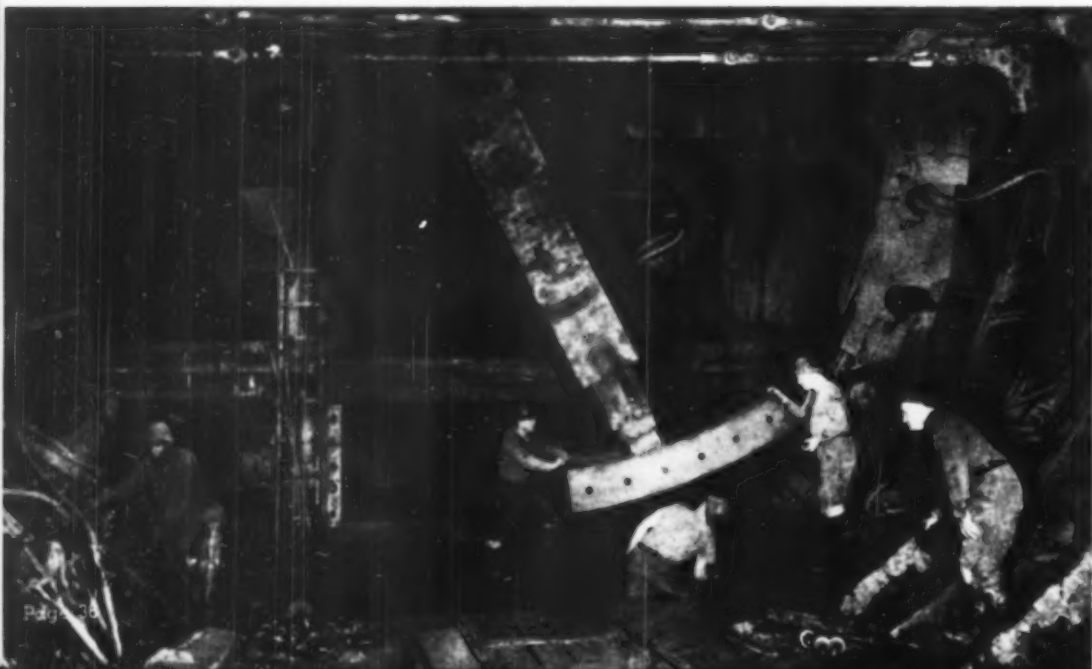
POWER HOUSE AT GRAND COULEE DAM on Columbia River, Washington, gets roof over its head, marking new construction stage on U. S. Bureau of Reclamation project. As concrete for 550-ft. high dam to contain 11,500,000 cu.yd. is placed from tall steel trestle by Consolidated Builders, Inc., construction activity centers about west (power house) wing (in foreground) which will be equipped with generators almost one-third larger than the biggest now in operation at Boulder dam.



THIN PRECAST SLABS of architectural concrete, measuring 10 to 12 ft. square and 2 in. thick, reinforced with wire mesh, serve dual purpose of outside forms and permanent facing for concrete abutments of Clinton Ave. bridge on Merritt Parkway at Westport, Conn. U-shaped anchor plates attached to reinforcement hold slabs in position during pouring of concrete backing. Surfaces of precast slabs are etched with muriatic acid to expose aggregate and produce pleasing architectural effect. Concrete slabs, eliminating use of outside wood forms, were precast in plant of Dextone Co., of New Haven Conn., for use by Mariani Construction Co., G. L. Dunkelberger designed bridge for Connecticut Highway Department.

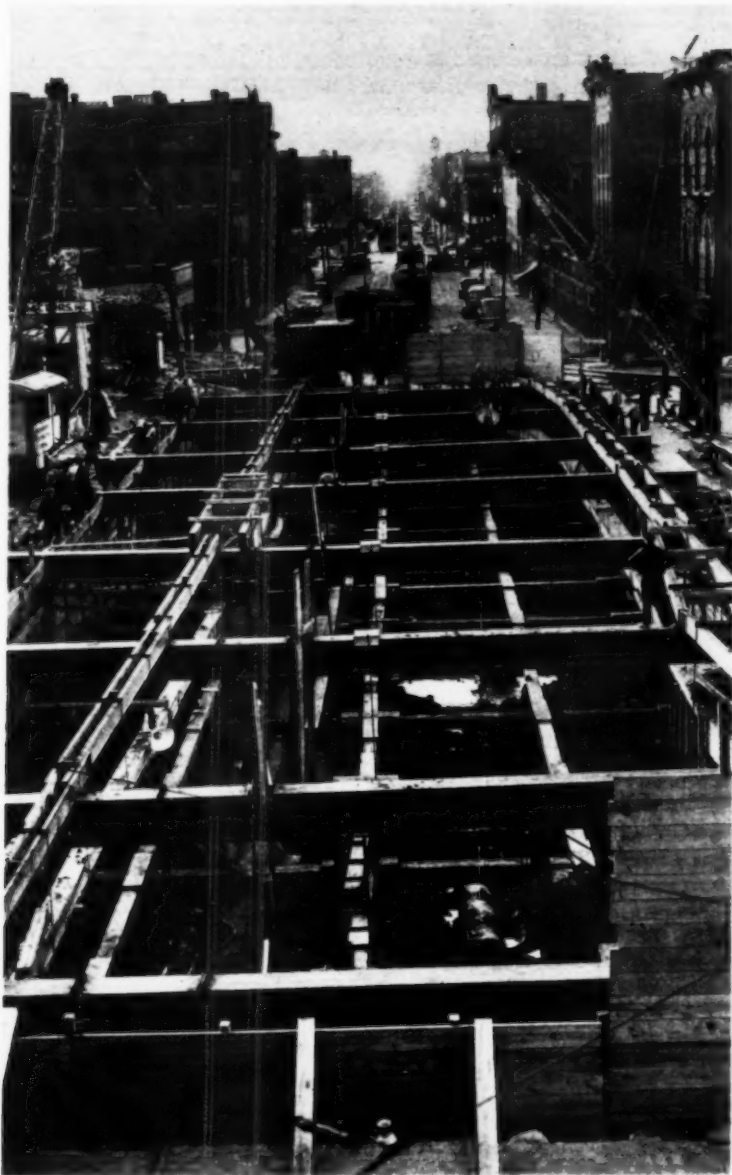


HEAD TOWER FOR CABLEWAY SYSTEM to place concrete at Shasta dam takes form as steel erection gets under way for structure that will rise to height of 460 ft. on U. S. Bureau of Reclamation's Central Valley project in California. In view herewith tower height is 140 ft. Two creeper derricks on sides of structure erect steelwork.



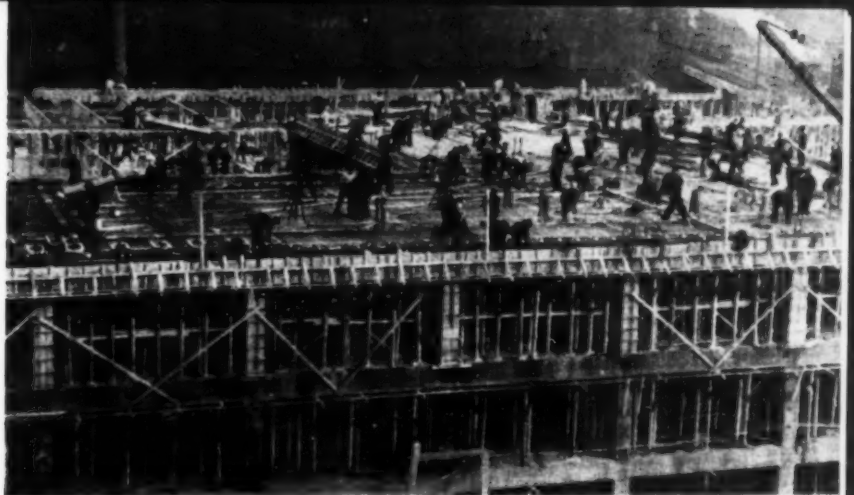
IN QUEENS-MIDTOWN TUNNEL (left), under East River, New York City, comprising twin 31-ft. diameter shield-driven bores about 4,000 ft. long holed through last November by Walsh Construction Co., giant erector places segment of cast-iron ring lining for \$40,000,000 project.



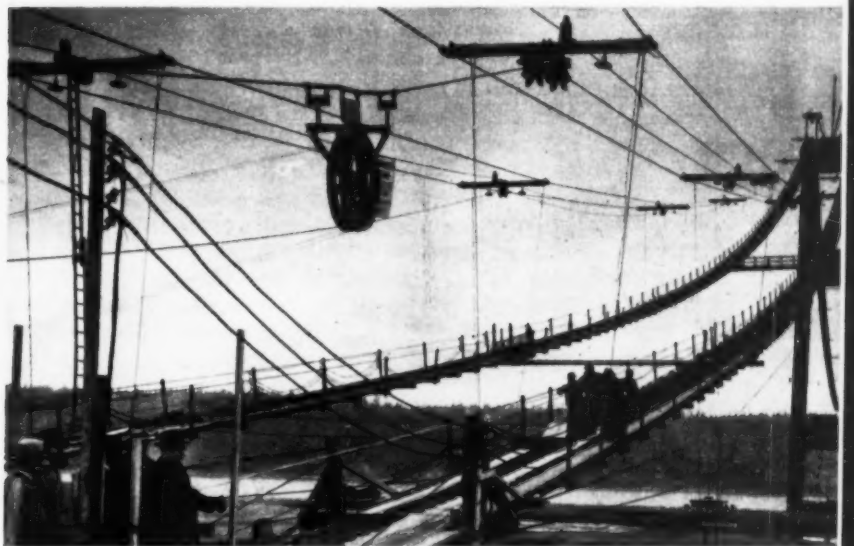


CHICAGO'S NEW SUBWAY is scene of construction activity along Milwaukee Ave., outside of downtown area, where open cut section is being excavated with cranes and clamshell buckets and steel framing and bracing placed by Paschen Contractors, Inc., under \$624,466 contract. Project traversing Loop district, involving $7\frac{1}{2}$ mi. of double-track route, mostly in tunnel, will cost \$40,000,000.

HYDRAULIC FILL FOR SARDIS DAM (below). $2\frac{3}{4}$ -mi. long flood-control structure on tributary of Yazoo River in Mississippi, is placed by government plant and day labor under direction of Vicksburg Engineer District, Lieut.-Col. Raymond G. Moses, district engineer. Total fill will be 16,760,000 cu.yd., of which 13,815,000 cu.yd. are being placed by hydraulic method. Maximum height of embankment is 117 ft. View looking north from south core plug shows closure section of main dam being completed by earth fill pumped in by dredge.



FAST CONCRETE POURING is recorded on new \$2,500,000 Federal Office Building in Washington, D. C., to provide for occupancy by staff of Census Bureau this spring. In 52 days after first floor was completed Nov. 11, pouring of concrete for six-story structure 320x360 ft. in plan was completed Jan. 2 by McCloskey & Co., of Philadelphia, general contractor, under supervision of N. A. Melick of Public Buildings Administration. Floors are flat slabs, 10 to 13½ in. thick, on mushroom columns spaced 19 ft. on centers. Work proceeded 24 hr. a day with a peak payroll of 1,500 men. For McCloskey organization Nielson Tallman was general superintendent and Hugh Gibson in direct charge of job.



CABLE SPINNING STARTS on 2,600-ft. main suspension span of Tacoma Narrows bridge across neck of Puget Sound, Washington. Structure with overall length of 5,560 ft. is carried by caisson piers, in water 80 to 180 ft. deep, supporting 425-ft. high steel towers. With bid of \$5,949,730, contractors for project are Pacific Bridge Co., Columbia Construction Co. and General Construction Co. Tower erection and cable-spinning are carried out under subcontract by Bethlehem Steel Co. Chief engineer for Washington Toll Bridge Authority is Lacey V. Murrow.

HYDRAULIC FILL in 26,000,000-cu.yd. Kingsley dam across North Platte River near Ogallala, Neb., is placed from trestle-supported beach pipes to be seen below and beyond steel truss bridge connecting outlet control tower, at left, with morning-glory spillway structure 101 ft. in diameter. Caterpillar diesel tractor and LeTourneau scraper to right of beach pipe comprise one unit of earth-moving equipment supplementing two 30-in. electric dredges, described in Construction Methods, Dec., 1939, pp. 32-36, used by Minneapolis Dredging Co.—Martin Wunderlich Co., contractors, to build dam for Central Nebraska Public Power & Irrigation District, George E. Johnson, chief engineer.



Regional Labor Agreement

Between Contractors and Craft Unions

Outlaws Strikes and Lockouts

SINCE APRIL 15, 1939 contractors and craft labor unions in 33 counties of Western Pennsylvania have been working in harmony under an agreement governing hours, wages and other conditions of employment in heavy construction (exclusive of building) and designed, particularly, to further continuity of employment and prevent strikes, lockouts and interruptions to work caused by jurisdictional disputes. The agreement represents the consummation of two years of conference and negotiation between the Constructors Association of Western Pennsylvania and a group of four American Federation of Labor unions comprising carpenters, operating engineers, hod carriers and common laborers, and teamsters, chauffeurs and helpers.

Representing the contractors in the negotiations was a committee consisting of C. E. Lott, president, John F. Casey Co.; D. A. Challis, president, D. W. Challis Co.; and J. S. Miller, senior vice-president, Dravo Corp.

The representatives of the American Federation of Labor in negotiating the agreement were: William J. Kelly, vice-president, United Brotherhood of Carpenters and Joiners; Nicholas Stirone, general representative, International Hod Carriers, Building and Common Laborers Union; Lloyd W. Shawl, International Brotherhood of Teamsters, Chauffeurs, Stablemen and Helpers of America; and Hunter P. Wharton, International Union of Operating Engineers.

Roy A. MacGregor, executive secretary of the Constructors Association of Western Pennsylvania was also active throughout the entire negotiation.

Basis of Negotiations

This committee set up the basis on which negotiations would be conducted as recognizing a difference between building construction and the work done by members of the association in heavy, railroad and highway construction. It desired the labor representatives to develop an organization apart from building trades councils to handle the operation of the agreement, which would provide for arbitration of all matters of argument.

Both the representatives of the labor unions and the representatives of the association entered the conferences with a determination to develop an agreement that was constructive, that would fit the business of construction and would be mutually beneficial. A preliminary agreement developed in the fall of 1937 proved objectionable at first to some branches of the A. F. of L., but this was straightened out and the agreement, as finally



J. S. MILLER, senior vice-president, Dravo Corp., Pittsburgh, who represented contractors on committee which negotiated labor agreement for Western Pennsylvania.

reached last April, differed but slightly from the first one developed. During the negotiations, which lasted over two years, union men were used on practically all of the work in and around Pittsburgh and relations were maintained on a harmonious basis, with no interruptions of work.

Major Provisions of Agreement

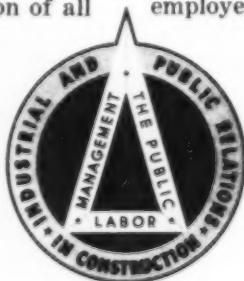
The major provisions of the agreement are as follows:

Workmen are free to select the contractor for whom they desire to work and the contractor is free to select the workmen members of the union whom he desires to employ. The contractor is sole judge of unsatisfactory performance by a workman and may discharge any man whose work is unsatisfactory. The number of men to be employed is also at the sole discretion of the contractor. The unions signing the agreement are the sole bargaining agents for all workmen employed on jobs covered by the agreement.

A contractor shall not be hindered in using any type or quantity of machinery, tools or appliances and may obtain materials or equipment from any market or source he sees fit, without interference. However, members of the union may refuse to work on or handle materials coming from any source where there is labor trouble, provided the contractor has been notified of such a condition. Labor trouble is defined as a strike of employees or a lockout on the part of an employer. The union selects one representative to confer with the employer on all matters pertaining to the agreement.

The agreement covers only heavy construction, railroad contracting and highway construction and does not apply to building construction.

The contractors agree to employ only members of the labor union unless there is a shortage of available union labor, in which case, after 36 hr. notice, non-union men may be employed until the union can supply the required number of able and



efficient workmen. These temporary workmen may become union members, without interference by the contractor or coercion by the union.

Wage Rates

The agreement contains a classification of workmen according to duties and responsibilities, and a scale of hourly wage rates. An important provision of the agreement is that "any workman may be temporarily shifted by the contractor from one classification of work to another classification of work, provided the workman is capable of performing the other work and is paid at the rate of wage for the classification which provides the highest wage rate." Hourly wage rates are based on a 40- to 48-hr. work week. The union agrees that no demand for an increase in any wage rate will be made on any job unless the parties concerned have agreed to a change in the rate prior to the time of bidding on the work involved. Time lost in any week by workers, due to weather conditions or other causes, may be made up during the following two weeks, but no employee is required to work more than 10 hr. per day. Otherwise, time and one-half is to be paid. For work done on Sundays or holidays the time-and-one-half wage rate applies, except for plant maintenance and repairs.

Should differences of any kind arise between a contractor and the union, it is agreed that there will be no lockouts, strikes or stoppage of work. All grievances and complaints which cannot be adjusted are submitted to a joint arbitration board consisting of three members chosen by the employer and three members by the union, with provision for two alternate members to assure full representation of both parties on the board. A majority opinion of the board constitutes its decision. Where no satisfactory settlement can be reached, an umpire is selected by the board or appointed by the Judge of the Common Pleas Court of Allegheny County. A majority opinion of the board and the umpire constitutes the decision of the board. The agreement is to remain in force until Jan. 1, 1941.

The agreement provides for a Board of Research of two members, one from the contractors and one from the union, to observe economic trends in the territory covered and report when it may seem advisable to increase or decrease wage rates or make changes in working conditions.

★ ★ ★

Discussion of *Labor Agreement*

By J. S. MILLER

Senior Vice-President,
Dravo Corp., Pittsburgh, Pa.

(At the request of Construction Methods Mr. Miller, who played a prominent part in negotiating the labor agreement for the Contractors' Committee, prepared the following comment.—EDITOR.)

IT HAS TAKEN A LONG TIME, but the labor agreement is now in force. Its primary purpose is the avoidance of jurisdictional squabbles. Briefly, the agreement is between the Constructors Association of Western Pennsylvania and four of the craft unions which have agreed to form a Council, separate and distinct from the Building Trades Council, for the handling of heavy construction, railroad contracting and

highway construction. This Council has been formed and has appointed one representative of the unions, who confers with the employer in all matters pertaining to the agreement.

The question will at once be raised: "Suppose a contractor wants a bricklayer and the bricklayer's union is not one of the parties to this agreement?" Here is the answer: The employer simply goes to the representative of the Heavy Construction Council and asks him to arrange for a bricklayer. Of course, if it is a bricklaying job of sufficient size it would probably be sublet to some contractor-bricklayer.

Looking Ahead

It must be remembered that heavy highway construction in Western Pennsylvania heretofore has been conducted on an open-shop basis, and few if any of the members of our association had ever worked with any of the unions. We had, therefore, to feel our way, as we realized that it was of the utmost importance that any agreement we might enter into must be one that would not only be workable, but one that would stand the test of the years to come. Furthermore, while there is very little private construction work going on at this time, and while public work fits in very well with union conditions, this state of affairs will not last forever. We must look forward to and be in shape to take on the private work when it is again available. We well knew that we could not afford to make any agreement that would prevent our competing with hired labor work by the railroads and other industries. Hence, our agreement with the unions must be one written especially to cover the heavy and highway construction industries.

Any labor agreement is just as good as the parties who attempt to work under it. If both parties are honest, fair and sufficiently broadminded to see both sides of a question, there should be no trouble. However, if either the employer or the union attempts to take advantage of the other, distrust and friction are bound to ensue and once a feeling of distrust is established, it becomes a major operation to cure its effect.

Labor Relations in New Light

Many contractors are looking at the problem of labor relationship in a way today that they would not have dreamed of ten years ago. By the same token many labor representatives are talking an entirely different language than they formerly used. The main reason that the heavy construction industry has stayed non-union these many years has been due primarily to the fear of jurisdictional squabbles. To stop work on a building for a week or two does not affect the work to any appreciable extent except in the actual delay that ensues. However, if you stop a heavy construction job such as a lock, dam, bridge, or even a highway, the work is exposed to risks of high water, bad weather, etc. Consequently, the heavy construction job must not stop, and any labor agreement having to do therewith must eliminate delays due to strikes and lockouts.

We used to think that the signing of an agreement with labor was of itself a one-sided affair, and that an agreement would be binding on the employer and not on the union. This may still partially be true. However, an agreement, or a specification under which the work is to be carried on, is necessary in order that both our supervisory force and our employees may know the rules of the game.

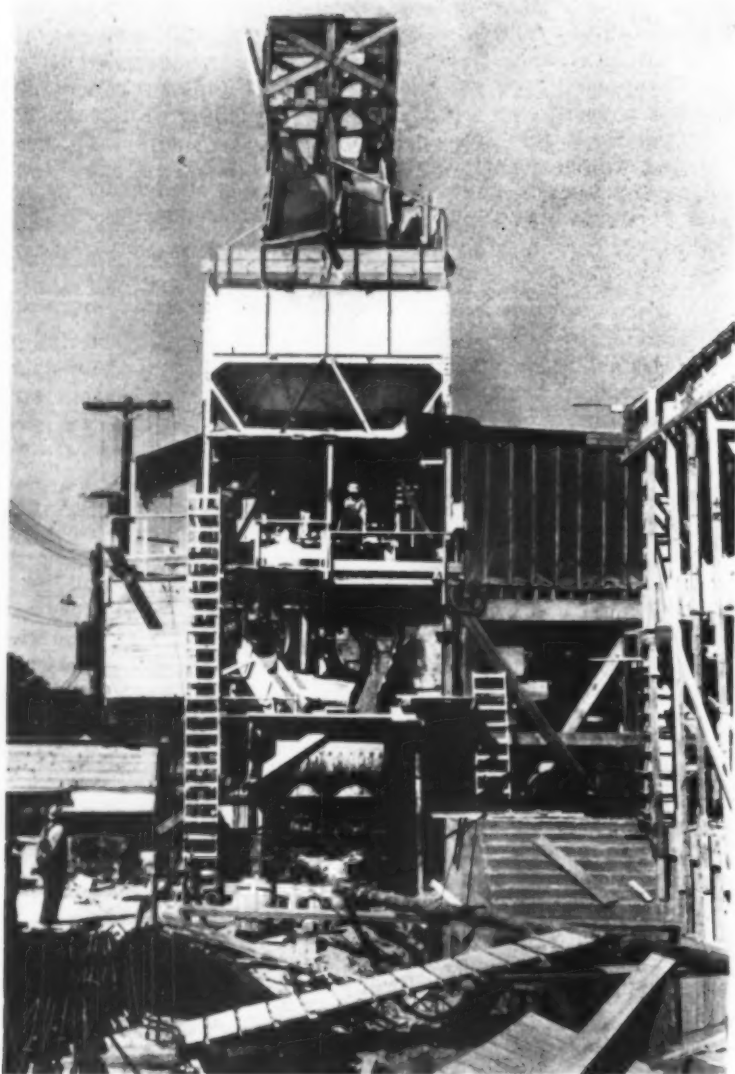
There are, no doubt, still a few employers who would like to take advantage of labor, and try to read into an agreement language that would give them a so-called edge. On the other hand, we will find some union representative who will approach the problem the same way, and to a certain extent both the employers and the unions should do a little housecleaning. None of us is perfect.

Union Responsibilities

Unionism now has every law in its favor. In fact, a good many of the laws are very much more in favor of the employee than the employer. Unionism should grow by leaps

(Continued on page 82)

Central Plant Pumps Concrete TO FOUR BUILDINGS



FROM TWO MIXERS, concrete flows into hopper of double-chambered pump installed on ground at base of plant. Cement house is at right, on level with batching platform.

PUMPING THROUGH PIPE LINES up to 900 ft. long, a double-chambered concrete pump stationed under a central mixing plant delivered 19,182 cu.yd. of concrete to four produce buildings erected under a \$1,350,000 contract by the S. Patti Construction Co., Kansas City, Mo., as part of a \$4,000,000 food market and terminal recently opened by Kansas City, Kan. Two electrically powered mixers supplied concrete in 20-cu.ft. batches to the hopper of the pump. Distributing concrete from the discharge end of the pipe line, the placing crew was able to deposit in forms as much as 500 cu.yd. in 8 hr. on slab pours. In slab work, depending upon the area available for concreting, the contractor obtained daily yardages of 420 to 512 cu.yd. Progress on wall construction, although slower, was quite good, as indicated by placement of 267 yd. in one 12-in. wall 11 ft. high in slightly more than 6 hr. — an average of better than 40 yd. an hour.

A complete set of prefabricated forms for one entire produce building — basement walls, first floor slab, frame and roof — made it possible for carpenters to keep ahead of the concrete gang and erect sufficient formwork to take the



SERVING FOR FOURTH TIME in construction of final produce building, column and beam forms give evidence of good condition, with location markings on column panels still plainly discernible.



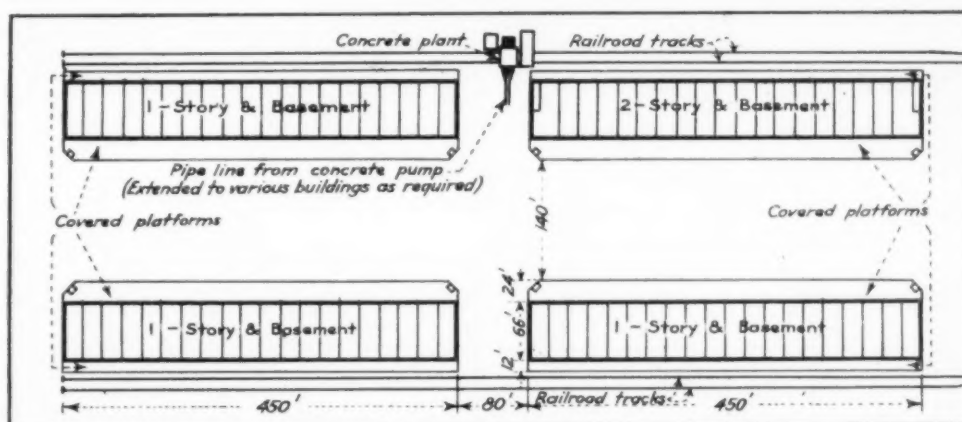
COMPLETE SET OF PREFABRICATED FORMS for one entire building permits rapid erection by large force of carpenters as work moves ahead by progressive stages on four similar structures. Concrete pipe rests on wooden tripods supported by slab forms in right background.



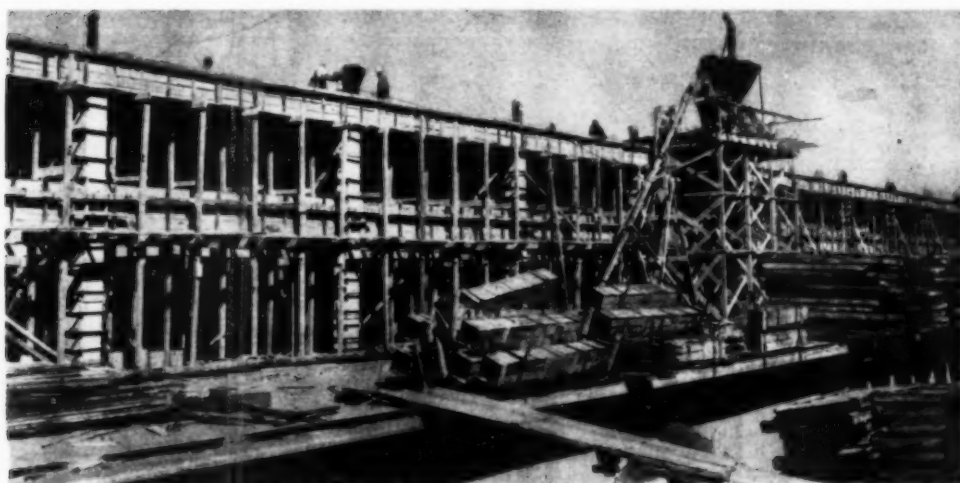
CONCRETE VOLUMES running to more than 500 cu.yd. per day are supplied to placing crew by double-chambered pump delivering through pipe line up to 900 ft. long. Two mixers of central plant discharge 20-cu.ft. batches through chutes into hopper of concrete pump.

output of the mixing and pumping plant. Three of the produce buildings are duplicate one-story and basement structures, and the fourth is similar save for the addition of a second story for offices of produce firms. Because of the similarity of the structures, one set of forms served all four buildings with only minor alterations.

Produce Buildings — As indicated by an accompanying plan, the four buildings are 450 ft. long by 66 ft. wide, with covered platforms on both sides. Reinforced-concrete frames and foundation walls rest on creosoted wood piles driven into pumped sand fill which forms the



CENTRAL CONCRETE MIXING AND PUMPING PLANT equipped with two mixers and a double-chambered pump delivers more than 19,000 cu.yd. of concrete to four produce buildings of Kansas City, Kan., food market and terminal. Pipe line up to 900 ft. in length carries concrete to farthest extremity of buildings. Railroad tracks are installed after erection of buildings.



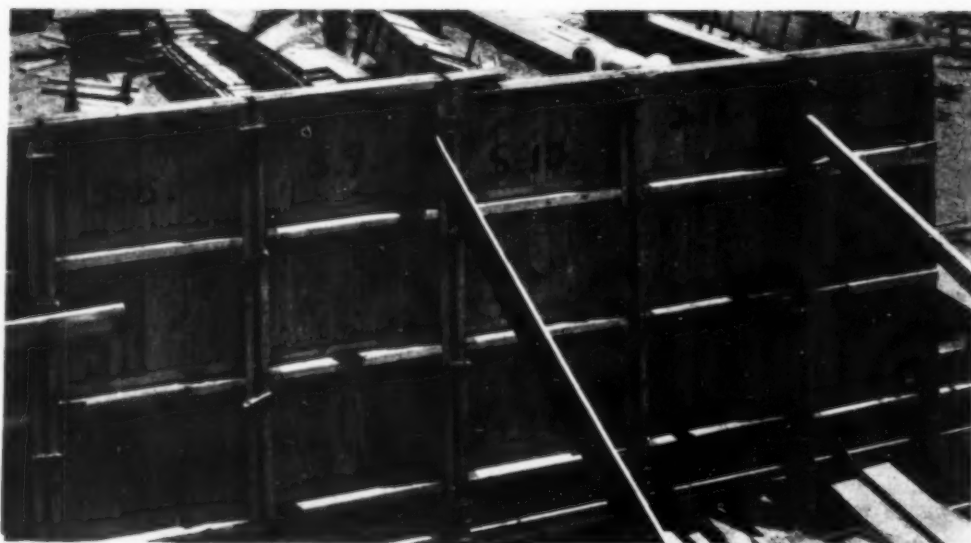
FOR SECOND-FLOOR SLAB of two-story building, pipe line delivers concrete to floor hopper on upper level of timber scaffold resting on floors of future sales arcade.



CONCRETE CARTS of 9-cu.ft. capacity, equipped with pneumatic tires, convey material from floor hopper to point of placement in second-floor slab of two-story structure. This method of distribution serves also in concreting roof slabs of all four produce buildings.

65-acre site for the food market and terminal. The buildings are designed for flexibility in space rentals and are fitted with 75 basement refrigerator rooms for banana ripening and cold storage of perishable fruits and vegetables. To handle produce between basements and first floor stalls, the buildings are equipped with 46 elevators. Superstructure walls are brick or brick and tile, and space units of the various tenants are separated by interior tile partitions.

Concrete Plant — At the central mixing plant, trucks dumped sand and gravel into a hopper from which the materials were raised by a double bucket tower elevator to Butler 75-ton steel overhead bins. Beneath the bins, a single set of Butler batchers equipped with Howe dial scales weighed the sand and



BY MARKING PREFABRICATED WALL PANELS for position, contractor speeds and simplifies erection of forms by carpenters.

(Continued on page 84)



AFTER BEING DUMPED and spread by hand, concrete is vibrated by electric-motor-driven flexible-shaft internal vibrator.



IN CHARGE OF CONSTRUCTION (left to right): WILLIAM J. NAUMAN, Jr., chief resident engineer-inspector for PWA; E. H. FARRAR, assistant superintendent for S. Patti Construction Co.; L. R. TILLOTSON, resident engineer-inspector for PWA; and G. G. MANLOVE, Sr., general superintendent for S. Patti Construction Co., contractor.



LONG VISTA IS OBTAINED inside 450-ft. produce building prior to erection of transverse tile partitions separating rental units.



PLYWOOD FORMS FOR CONCRETE DECK of mezzanine floor on one side of produce building are supported by simple blocking from lower flanges of I-beams.

HIGH-SPEED TRACTORS OF NEW DESIGN, operating at 7 m.p.h., and powered by two-cycle diesel engines, were given an exacting test in moving earth with large scrapers and bulldozers on a levee-building project along the Rio Grande, boundary line between the United States and Mexico, at Harlingen, Texas. The job involved enlargement of levees, originally built with draglines by the International Boundary Commission, and construction of a diversion channel to divert flood waters to the Gulf of Mexico by a direct route.

The new levee is 12 ft. wide at the top, with slopes of 1 on 3 and will average 16 ft. in height, depending on the location. Earth is borrowed from the river side of the levee, and in the diversion channel the borrow pit will form a pilot channel between the two levees, which are $\frac{1}{2}$ mi. apart.

R. W. Briggs & Co., of Pharr, Texas, one of the large contractors of the Southwest, was awarded a contract involving 3.2 mi. of levee with 392,000 cu.yd. of earth to be moved. As all of its plant was working on other contracts, the Briggs company had to obtain new equipment. About this time the Allis-Chalmers Manufacturing Co. was looking for a tough job to test an experimental crawler tractor powered by the new General Motors two-cycle diesel engine. Finding that the Texas levee job met this requirement, the company rented

Tough Levee Job

TESTS NEW HIGH-SPEED DIESEL TRACTORS

six of its new experimental tractors to R. W. Briggs & Co. Four of these tractors were used to pull Gar Wood-Continental 15-yd. cable-operated scrapers, the fifth was equipped with a pusher plate, and the sixth with a Baker bulldozer and pusher plate. Later, as the job progressed, one of the tractors was used to pull a Gar Wood 20-yd. hydraulic scraper on the longer hauls.

After work began Feb. 15, 1939 and progressed rapidly on a 24-hr. day basis, 6 days per week, Mr. Briggs bid on and was awarded a 6.7-mi. stretch of levee adjacent to the original contract that required the moving of 457,000 cu.yd. Pusher tractors were used on both jobs to reduce loading time and increase

yardage. On short hauls both pushers were kept busy, but for the longer hauls one pusher was sufficient for the four scrapers.

Because the borrow pit of the early dragline excavation was next to the original levee, it was first necessary to fill and compact it to the height of the old levee and then build the whole levee up to the specified cross-section. The specifications called for 6-in. compacted lifts to be rolled eight times with a sheepsfoot tamper. To do this it was necessary to put on 10-in. lifts with the scrapers. A bulldozer leveled each lift and then broke up the lumpy clay with a disk harrow.



TWENTY-FOUR HOURS A DAY, six days a week, were the working conditions on the Briggs levee construction job in Texas. New diesel tractor is designed for 7-m.p.h. operating speed.



TOUGH GOING in Texas gumbo puts diesel tractor to real test in loading 15-cu.yd scraper with aid of pusher tractor.

A number of unusual conditions made this job difficult for the contractor and for the tractors and scrapers. The contractor was being paid for compacted yardage in the levee and not by bank measure. If the levee did not come up to the required cross-section templet, it could not be added to, but the side had to be torn down and again built up by lifts.

Two other conditions with which the contractor had to cope were a moisture content requirement for the earth levee fill and variations of the material in the river bottom. The moisture content of the fill had to be maintained between 18 and 24 per cent. Much of the time the scrapers loaded in standing water, which meant that a dry layer had to be put between the wet ones, no matter how long the haul to obtain dry earth. Also, the job was often held up because the water trucks couldn't wet the dry earth fast enough during dry periods.

The material ranged from wet clay and sand to Texas gumbo, and because it was deposited by the river in layers, Superintendent J. M. Schilling never knew what was coming

next. The composition of the fill was rigidly specified, adding to Mr. Schilling's worries, as he had to make long hauls to provide the right mixture. The tractor-scraper would frequently hit soft holes and quicksand and bury themselves. At times three and four tractors were required to extract a scraper.

Such were the conditions that this contractor tackled. Yet with the new 7-m.p.h. tractors, an estimated 824,131 cu.yd. of bank measure earth were moved on an average 1,510-ft. round-trip haul at a rate of more than 100 cu.yd. per actual hour worked per tractor. On one 7.7-hr. shift, under favorable conditions, the four tractor-scraper carried 476 loads on a 970-ft. trip. Knocking off greasing time, each unit carried 17.8 loads per actual hour worked, averaging 153 pay yards per hour. On another occasion one tractor-scraper unit was observed making 27 heaping loads in an hour on an 800-ft. trip.

(Continued on page 88)



PUSHER TRACTOR with bulldozer blade speeds up loading of scraper hauled by high-speed diesel tractor

Prefabricated Tunnel

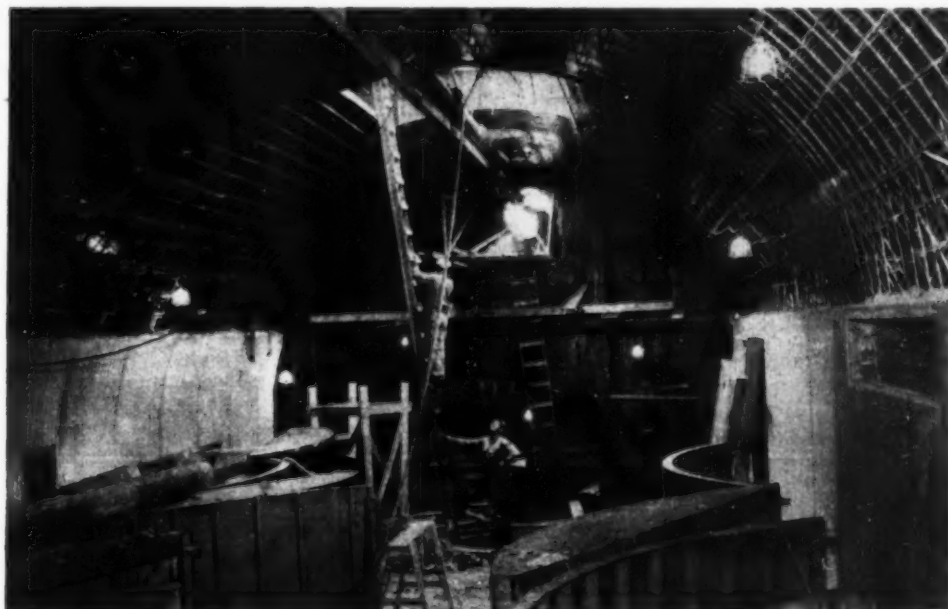
PLACED UNDER MOBILE RIVER

PREFABRICATED STEEL TUNNEL SECTIONS nearly 300 ft. long are being lined with concrete, floated to position and sunk in a trench at a maximum depth of 85 ft. below mean low water to form the Bankhead vehicular tunnel under the Mobile River at Mobile, Ala., designed to shorten the approach to the city by U. S. 31 from the north. A length of 2,100 ft., including an 1,100-ft. river crossing and 500 ft. on each shore, is being placed in trench by the Arundel Corp., general contractor, Baltimore, the shore sections being floated into position in wet cofferdams. The tunnel provides a clear roadway width of 21 ft. with a police walk on one side. Total length of

(Continued on page 93)



STEEL TUNNEL SECTIONS 34 ft. in diameter and nearly 300 ft. long are fabricated on land, lined with concrete and floated to position for sinking into trench on river bottom at Mobile, Ala.



BULKHEADED at both ends to keep afloat after anchoring, tunnel section is lined with 18 in. of reinforced concrete.



STEEL REINFORCEMENT for concrete lining is hooked to rods previously welded to inner skin of tube.



SPOUT DELIVERS CONCRETE to wheelbarrow inside tunnel section for placement in 18-in. lining.



HOW TO GET BETTER SERVICE FROM *Wire Rope*

By **WALTER C. RICHARDS**
Engineer, A. Leschen & Sons Rope Co.
St. Louis, Mo.

● In the accompanying article Mr. Richards offers to construction men valuable advice on the proper selection and use of wire rope to insure satisfactory service, long life and safety. — EDITOR.

WE ALL WANT the things we buy to give us the best service, or the longest period of satisfactory use obtainable. But do we always give these things the "breaks"? Do we set them up, or put them to work, with a full knowledge of the conditions under which the work must be performed, and do we watch over them while working to see that nothing goes wrong? Or do we install them and go away and forget about them until a failure occurs?

It seems that quite often wire rope is a "forgotten" product, and that it does not always get a fair chance. In many cases it is just taken for granted. We are sure that is not so much a case of carelessness as it is lack of information, so we will undertake to review conditions which influence ultimate rope service. The operator or user should know what constitutes good conditions and be able to recognize bad conditions when they develop.

The advantages to be derived from using a quality article are almost uni-

versally recognized. It is assumed that rope of the best quality is being purchased and that this element will not require discussion. Quality, however, should not be confused with the word "grade" when applied to wire rope. The divisions or classifications of the wire, according to its strength and other qualities, are termed grades, and each is of the highest quality when put out by a reputable manufacturer.

Four Grades of Wire Rope

There are four such grades of steel wire rope suitable for general construction work. We are not here considering elevator ropes, nor including guy ropes or strand. Each has its special field, but in every instance where safety of life and property is concerned, it pays to use the highest grade. The seller will always advise, but the user should understand the differences between grades and know just which one he should use.

The Federal Specifications Board of the U. S. Government recognizes these

four grades and designates a minimum tensile strength for each as follows:

| | |
|-------------------------|------------------------|
| Cast steel | 170,000 lb. per sq.in. |
| Extra strong cast steel | 190,000 " " " |
| Plow steel | 210,000 " " " |
| Improved plow steel | 230,000 " " " |

Cast steel is a grade of moderately high tensile strength and considerable flexibility, and is standard for ordinary work. Extra strong cast steel has the same flexibility as cast steel, but possesses a higher efficiency and is very dependable within its working limits. Plow steel is a grade of high tensile strength and possesses considerable resistance to abrasion. It is used for heavy work, but demands the use of larger sheaves and drums than the lower grades of steel. Improved plow steel is the highest grade and possesses not only great tensile strength, but exceptional toughness and flexibility. It withstands wear and fatigue to the highest degree. It is recommended for all severe working conditions. Each manufacturer generally furnishes this grade under his own brand name.

Fatigue, abrasive wear and corrosion are the chief destroyers of rope, and of these fatigue probably accounts for the deterioration in use of most wire. Where this fatigue of wire is the factor to contend with, the improved plow steel grade is the one to use.

Types of Strand Construction

Excessive abrasion is best combatted by selecting a strand construction that will present large outer surfaces for abrasion. This means that some resistance to fatigue will have to be sacrificed, because no strand construction can fill both requirements. Each strand construction, which is designated by the number of principal wires in the strand, has been designed to fill certain conditions. Those with large wires are, of course, most resistant to wear but least resistant to fatigue, whereas the opposite is true in the case of those with a large number of small wires. A few of the constructions most commonly used are illustrated in Fig. 1.

The construction known as 6x7 (6 strands each containing 7 wires) represents one end of the scale, and the ropes with these large wires are used for haulage systems, cableways and mine inclines. As the number of wires increases and their size decreases, the flexibility increases until, at the other end of the scale, which would be represented by the strand constructions known as 6x37 and 6x37 type, we have the ropes chiefly used on shovels, cranes, hoists and the like. There are many combinations of wires used lying in between these limits which have been developed for some particular use. Differences in some cases are so small that there hardly seems justification for their existence, but at the same time in some localities and for some uses they find favor.

The operator should be reasonably familiar with the various strand constructions and the names that are applied to them. The 6x19, for example, is the commonest construction used, but there are three ways in which the wires in a strand of this designation are arranged, and there are several names by which it is called. In two cases the wires are arranged in two layers—6 in the inner layer and 12 in the outer layer. If the 12 outer wires are of two sizes, alternating, the construction is known as Warrington. If the wires in the outer layer are all of one size, and there are 6 small wires in the valleys of the inner layer, the construction is known as Filler Wire. In the third construction,

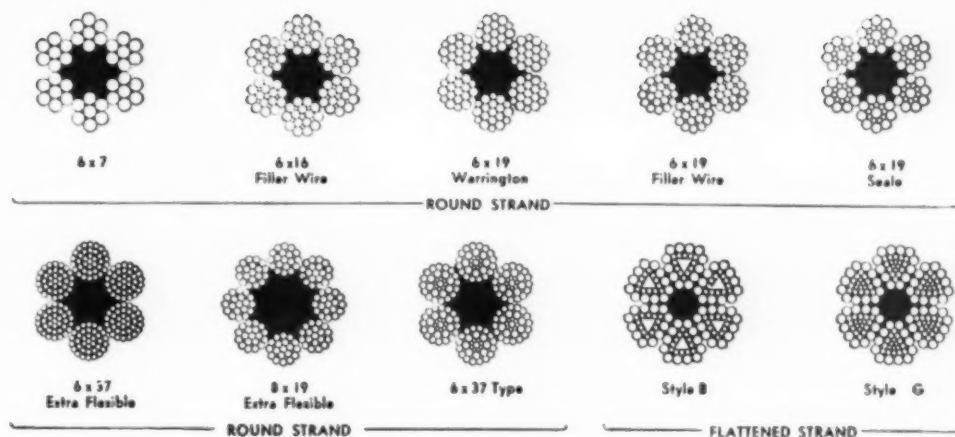


Fig. 1 TYPES OF STRAND CONSTRUCTION for wire rope most commonly used. Numerals, such as 6x7, mean a rope of 6 strands each containing 7 wires.

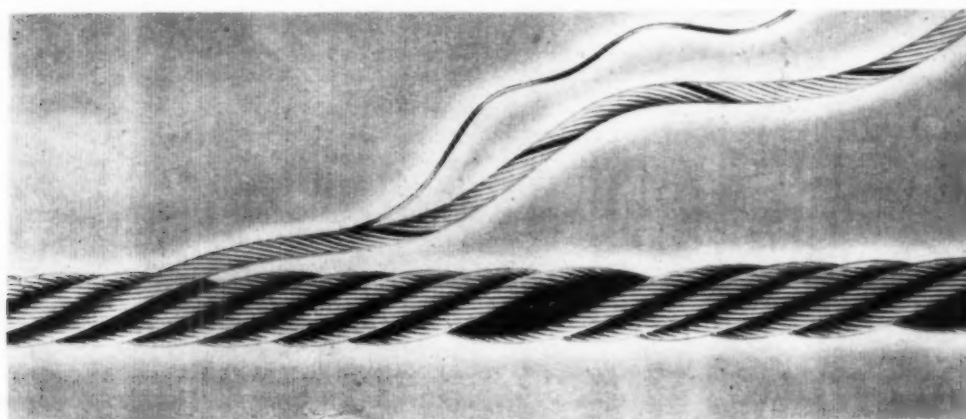


Fig. 3A IN PREFORMED WIRE ROPE each wire and each strand is preshaped to the exact helical curve it must assume in the finished rope, so that elements are under no internal stress or tension.

known as Seale type, both layers are made up of 9 wires of equal size, the larger ones on the outside. By referring to the three 6x19 end sections of strand types shown in the top row of Fig. 1 the three arrangements will be seen.

The strand construction is usually designated by the number of wires used, exclusive of the filler wires. These filler wires are put in for compactness rather than to add strength. Some manufacturers, however, include the fillers in their count, but this practice causes confusion. For example, the filler wire construction of 6x19 is sometimes called 6x25 filler wire, modified Seale, and spacer Seale—terms which are not fully understood by the user.

Core and Lay

Along with the strand construction there is also the center or core to be considered, the selection being determined by the use of the rope. This has its influence on the service secured. The three centers shown in Fig. 2 are hemp, wire rope center and metallic core. The hemp center is generally used for ordinary work. The wire rope center and metallic core, which is a strand of approximately the same number of wires as the main strands, are used where more solidity is required or excess strength is desired, or where high unit pressures are encountered. A wire rope



Fig. 2 . . . THREE TYPES OF CORE or center of wire rope include hemp center, wire rope center and metallic core.



Fig. 3 . . . TYPES OF LAY for wire rope are designated as regular and Lang's.



Fig. 5 . . . WORN ROPE has made such deep cut in sheave that new rope will not fit in groove.



Fig. 4 . . . DEEP GROOVE has been cut in sheave by wire rope which has worn strand corrugations in metal surface.

SPEED - POWER

WORLD'S QUICKEST-STARTING • F



Only
ALLIS-CHALMERS
Offers YOU These
MONEY-SAVING FEATURES

- 1 **TRIP-GAINING SPEEDS** — You lengthen profitable haul distances . . . cut round trip time.
- 2 **108 DRAWBAR H. P.** . . . more than any other tractor now on the market.
- 3 **DIME-A-SHIFT LUBRICATION** — Positive-Seal truck wheel assembly requires lubrication only once in 200 hours. Reduces track roller and idler lubricant cost to less than a dime a shift.
- 4 **NEW "LONG-WEAR" BI-METALLIC BRAKES AND CLUTCHES** — Records from night and day operations on tough jobs show they outlast ordinary brakes and clutches several times over.
- 5 **GENERAL MOTORS 2-CYCLE DIESEL ENGINE** — Proved by moving 2,000,000 cu. yds. of mud, rock and sand on jobs from Coast to Coast.

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CONSTRUCTION DIVISION - MILWAUKEE, U.S.A.

Hit the road to profits . . . at a fast clip. Split-second electric starting gets you under way without fuss, bother or time loss. 108 drawbar h.p. rolls up big loads . . . hauls 15 and 20-yard scrapers at speeds up to 616 ft. per minute. That's 150 ft. (nearly a third) faster than other tractors. Amazing flexibility cuts out plenty of gear shifting and operator arm weariness . . . enables you to operate from rated speed down to almost half-rated speed in any gear without loss of drawbar pull. Positive-Seal truck wheel assembly and "Long-Wear" brakes and clutches reduce time losses . . . assure you steady, profit-making operation. You can be a money-making successful bidder with this extra **POWER** . . . extra **SPEED** . . . great **FLEXIBILITY** . . . and extra **OPERATING TIME**. Your Allis-Chalmers dealer will gladly prove the profit possibilities of the HD-14 . . . on your own job . . . **NOW**.

RED FOR YOUR PROFIT

FASTEST-MOVING · MOST POWERFUL DIESEL TRACTOR!



H-D
14

Faster Diesel Power!

NOTE TO OPERATORS — You'll like the HD-14's sweet running engine. It's the nearest thing to electricity in a tractor today. It really gets down and hangs on — no more see-sawing on steering levers to get your load in tough going. There's plenty of power and speed, too . . . combined with a lightning pick-up that enables you to drive with the throttle instead of shifting gears all the time. The cleanest deck and most comfortable seat

you've ever used. Try it!

FLEET USERS — MORE PROFITABLE PUSHER OPERATION — Think of the loads you can put into big scrapers with 108 drawbar h.p. pushing and 108 drawbar h.p. pulling! What's more, the HD-14 has the power to take those extra-big loads to the fill faster than any other tractor. Users say four HD-14 tractor-scraper outfits with an HD-14 pusher will move *more* dirt than six ordinary tractors — at

savings of 15 to 25% in equipment investment! Let us show you.

NO EXTRAS TO BUY — Standard equipment on the HD-14 includes electric starter and lights, muffler, radiator guard, crankcase guard, front pull hook, bumper, hour-meter, radiator shutters, fenders and heavy truck wheel guards. No spending of \$400 to \$500 for extras . . . you get a complete tractor, ready to go to work.

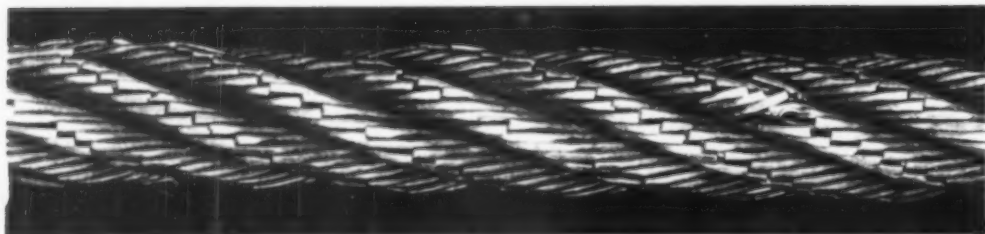


Fig. 6 . . . **BROKEN WIRES** appear in rope that has been used over a sheave of too small diameter.

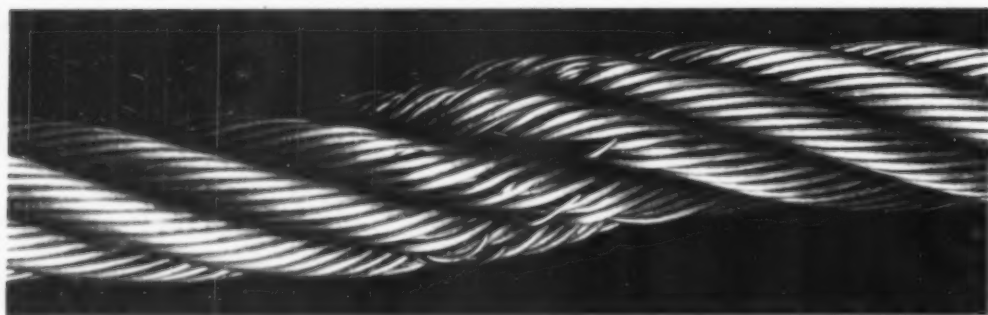


Fig. 7 . . . **KINK STRAIGHTENED OUT** under high tension produces disturbed wires and strands.

working in intense heat also requires a steel center.

Along with the strand construction and the center the "lay" of the rope should be considered. The ordinary rope is made regular lay, which means that the wires in the strands are twisted in the opposite direction to the strands in the rope. This results in comparatively short lengths of wire being exposed on the outer surface. In the case of many ropes used in construction work, where abrasion is serious, a Lang's lay rope is used because a much greater length of wire is exposed on the outside of the rope to take this abrasion. In this Lang's

lay construction the wires in the strands are twisted in the same direction as the strands in the rope. These two wire arrangements are illustrated in Fig. 3.

The preceding comment deals with round strand ropes. There is another construction known as Flattened Strand, in which the strands have a triangular cross-section instead of a circular cross-section, as shown in the lower row of end sections in Fig. 1. This arrangement of wires allows of an even greater percentage of wire length being exposed to abrasion, and consequently this type of rope will, in many situations, outlast a round strand rope.

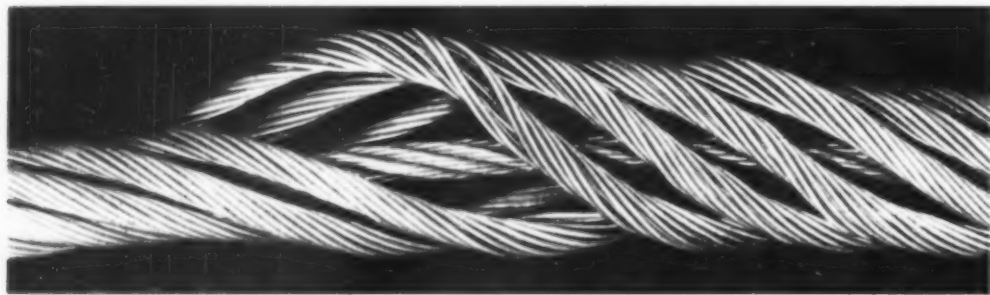


Fig. 8 . . . **"BIRDCAGE"** results from operating rope over sheave with tight groove. This rope moved backward and forward only a short distance and carried a heavy load in only one direction.

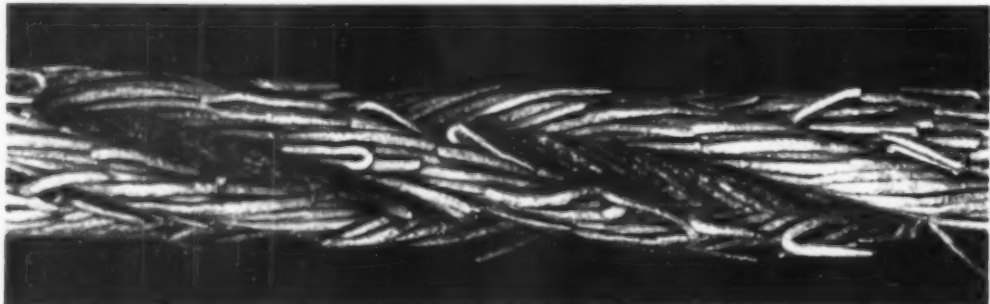


Fig. 9 . . . **CORROSIVE WATER** and lack of proper lubrication destroyed this rope, in which wires have been deeply pitted.

Greater strength is also provided by this type of construction, consequently a greater factor of safety.

Any of these ropes may be non-preformed or preformed. By means of the preforming process (Fig. 3A) the wires and strands are set during manufacture to the position they will occupy in the finished rope, which makes for more flexibility and easier handling. They will not kink so easily and they wind on drums more evenly. The strands of these ropes will stay in place even though the ends are not served, and broken wires will not protrude. In many cases this type of rope will give greater service.

Although the correct rope has been selected, which by all rules of practice should give the best results, service is not always satisfactory to the owner. Is he then justified in saying that the rope is not what it was represented to be? Has he considered the nature of the work and the condition of the equipment? Here is a situation with a three-cornered responsibility. This might even be increased to four, if we consider the human element.

Sheaves and Drums

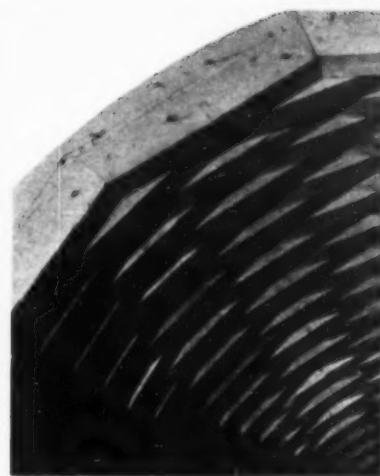
Assuming that construction men buy just as good equipment as they do rope, conditions may develop in the best of machines that are detrimental to wire rope. All moving parts will eventually show wear. Sheave and drum grooves will get out of shape. Worn bearings will produce misalignment. Accidents may cause misalignment, followed by excessive wear. When the rope pressure is greater than the metal of sheaves and drums will stand the grooves become corrugated to fit the strands of the rope, as shown in Fig. 4. Also, as the rope wears and stretches, the grooves become narrower (See Fig. 5.). Sheaves that get out of alignment have their flanges worn thin. Drums which are out of line cause the rope to climb at the flanges, and result in bad spooling. New ropes under practically all of these conditions will be damaged by the sheaves and drums, and cannot give full service.

Improper drum winding causes broken wires. This is sometimes due to the fact that the first layer on the drum cannot be put on under the proper tension, or it may be caused by the second or succeeding layers not starting to wind back at the proper point. Unnecessary slack should not be allowed to accumulate in the rope, as loops may form, and perhaps kink. Also, the taking up of this slack frequently results in severe jerks and overstressing of the rope.

For maximum average service rope should not be bent over sheaves that are smaller in diameter than the tables shown in the manufacturers' catalogs. On many machines, however, space is limited, and weight and other factors have a controlling influence on the de-

(Continued on page 90)

JOB oddities

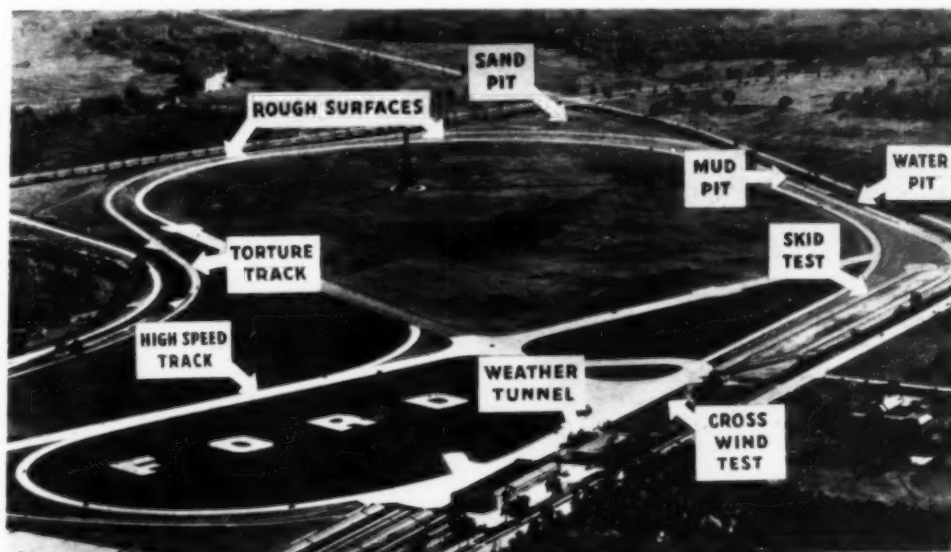


"BIG JOE" LOSES HIS HEAD as master surgeons of Albert A. Volk Co., contractor, New York, start dismembering 80-ft. stainless steel statue atop 180-ft. pylon in front of Soviet pavilion, which is being carefully dismantled at New York World's Fair for shipment to Russia and eventual re-erection there.

TUNNEL OF WOOD is built at ground level near site of Shasta dam on U. S. Bureau of Reclamation's Central Valley project in California to serve future stock piles of sand and gravel aggregates. Stored material will be removed, as needed at concrete mixing plant of Pacific Constructors, Inc., by belt conveyors operating within wood passageway and led by gravity through openings in wood tunnel roof. Note rounded roof (upper photograph) of arch segments cut by band saw.



BELT SLINGS handle marble for Morretti-Harrah Marble Co., Sylacauga, Ala., where pair of Goodrich 4-in. four ply Highflex endless belts 24 ft. long lifts loads up to 10,000 lb., subjecting belts to ten times tension ordinarily required in power transmission for which they were originally designed. In spite of severe service, no failures of Plylock belt splice have been reported.



TO PROVIDE ADDITIONAL TESTS of motor car design and performance, Ford Motor Co. supplements test tracks and wind tunnel at engineering test grounds with new mud pit, water pit, sand pit and skid test section. First two pits test effect of mud and water on springs, steering mechanism and controllability of car, as well as water tightness of brakes and ignition system. Other tests determine weaknesses and possible improvements in car design to meet most severe weather and driving conditions.

WELDERS FABRICATE

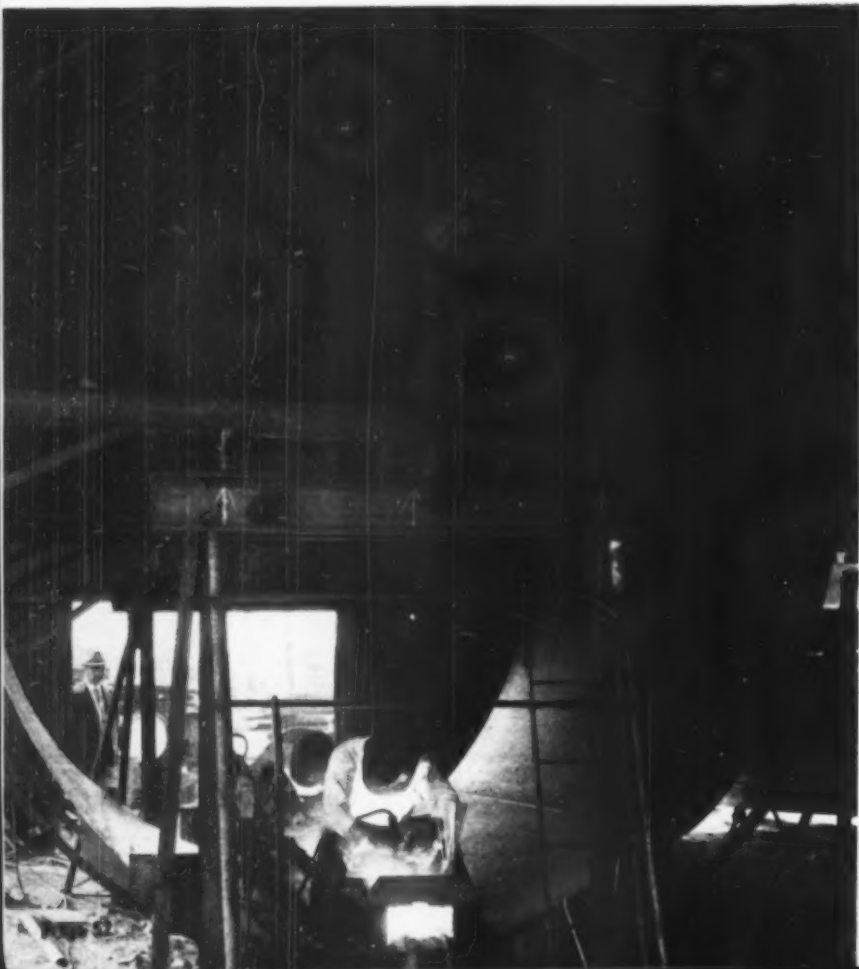
Huge Steel Cores

FOR AQUEDUCT PIPE

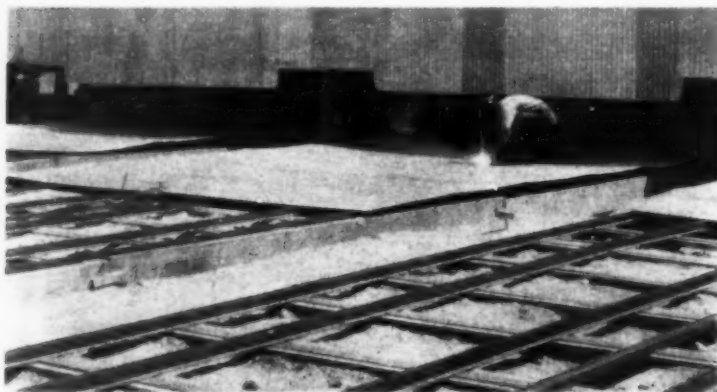


REINFORCING CAGE is welded to steel pipe section supported on rollers which permit it to be rotated easily.

FINAL LONGITUDINAL SEAM (below) is welded by two operators after steel plate unit has been rolled into cylindrical form.



FOUR 200-AMP. MOTOR-GENERATOR SETS supply current for welding reinforcing rings to steel pipe.



PRIOR TO SEAM WELDING, operator tack-welds steel plates together, ready for automatic machine.

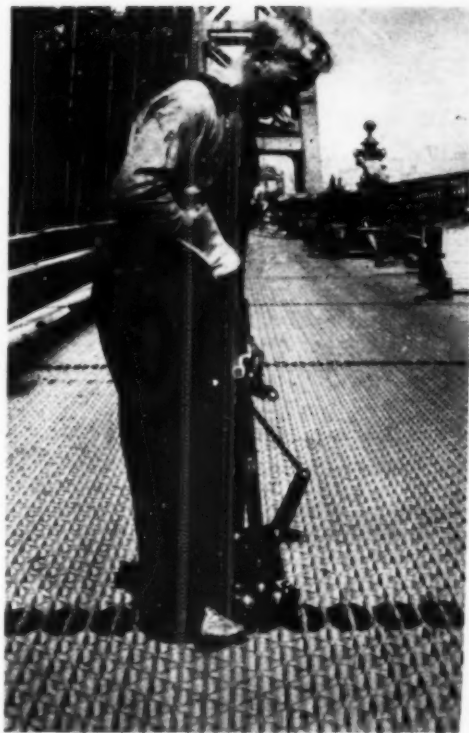
DESCRIBED AS THE LARGEST PIPE of its kind ever built, a welded steel and concrete conduit $14\frac{1}{2}$ mi. long will eventually bring 300,000,000 gal. of water daily to residents in Boston's Metropolitan Water District. The new pipe line, or pressure aqueduct, made up of individual sections weighing from 45 to 50 tons, will carry water from Wachusett Reservoir to a distributing point in the Metropolitan area. Construction work is proceeding under the direction of the Metropolitan District Water Supply Commission, and it is expected that the line will be completed early in 1940. Fabrication of steel cylinder and reinforcement assemblies for the concrete pipe is being handled by the American Concrete and Steel Pipe Co. under a subcontract with the Lock Joint Pipe Co., Ampere, N. J.

Two different size sections of pipe are being fabricated by welding, one section $12\frac{1}{2}$ ft. in diameter by 12 ft. long and the other $11\frac{1}{2}$ ft. in diameter by 16 ft. long. In fabricating the steel sections, flat steel plates first are tack-welded together to hold them in position for seam welding. To assure maximum strength of these welds, a special plant has been developed to weld the seams automatically. Current for the automatic welding is supplied by four G-E 500-amp. transformer-type welding sets.

After the seam welding in the flat position has been completed, the plates are rolled to form a hollow cylinder, and the final seam is made manually. Bell-and-spigot rings next are welded in place, and the section then is placed on a revolving mandrel to permit reinforcing rings to be welded on. Welding current for this last operation is supplied by motor generator arc welding equipment, including a number of G-E 200-amp. sets. The steel section, weighing from 5 to 10 tons, is then ready for concreting.

Each completed cylinder with rings welded to it is shop tested hydraulically for strength and water tightness. When the pipe sections are assembled in the trench, the joints (of patented bell-and-spigot type) are calked with special lead gaskets. At the present rate of construction, twenty to 32 completed sections are turned out per day.

**OPEN
STEEL GRATING**
*Reduces
Floor Load*
ON BRIDGE ROADWAY



FOR COLD-RIVETING CONNECTIONS between grating sections on this job, contractor develops special machine, now patented, which applies pressure by means of vertical jacking screw. Tool is said to be lighter and faster than ordinary device, which develops pressure by spreading two lever arms.



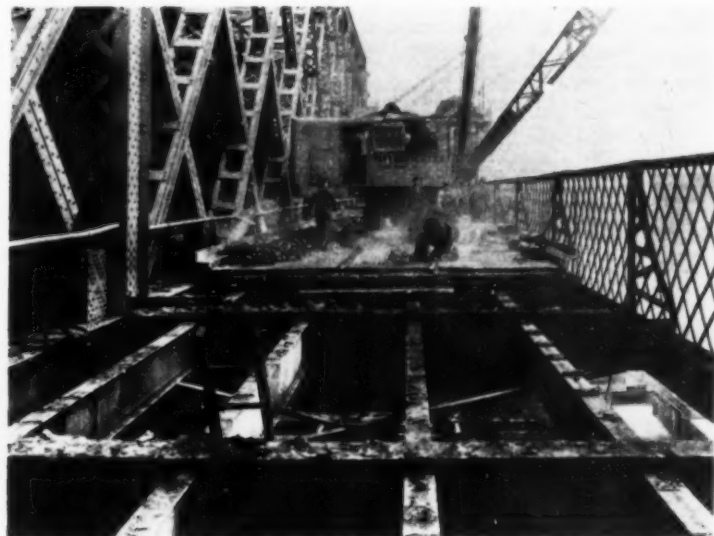
PREFABRICATED UNITS made up of open mesh steel grating and transverse underfloor beams are placed on existing floor system to modernize 20-ft. outer roadways of Williamsburg suspension bridge.

OPEN MESH STEEL GRATING recently substituted for wood block flooring in the two 20-ft. outer roadways on the main span of the Williamsburg bridge over the East River, New York City, provides a modern decking of good all-weather tractive characteristics at a saving in dead load. The Taylor-Fichter Steel Construction Co., New York, removed the old deck, consisting of wood blocks on 10-in. channels laid with flanges turned down, and installed a total of 62,000 sq.ft. of Blaw-Knox Irving steel

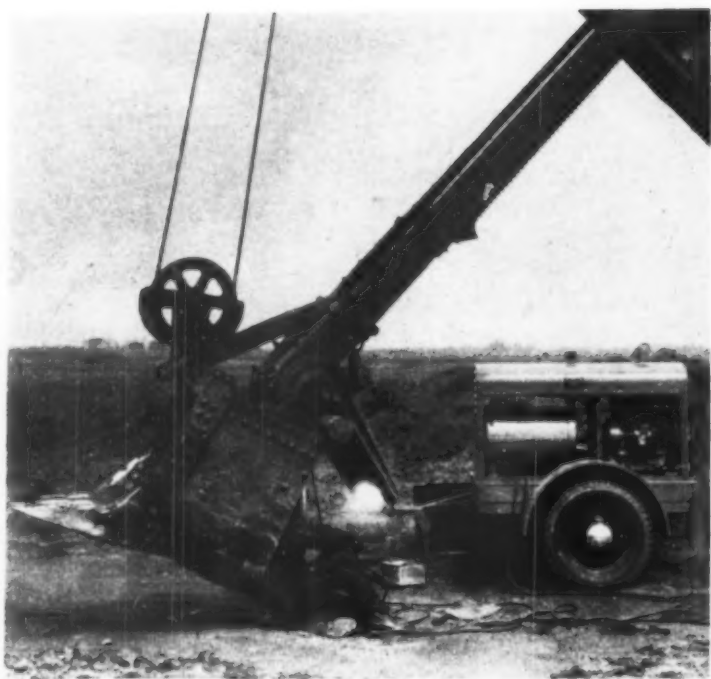
grating on 6-in. transverse beams at 16-in. centers. Grating and transverse beams were prefabricated by welding in 12x20-ft. and 8x20-ft. units for delivery to the bridge, where the 6-in. underfloor beams were welded to the existing stringers. Reconstruction of the roadways was carried out by the New York City Department of Public Works under the direction of Irving V. A. Huie, commissioner, and Homer R. Seely, deputy commissioner in charge of bridge construction and maintenance.



OLD DECKING of wood blocks on steel channels is removed to make way for lighter, non-skid flooring.

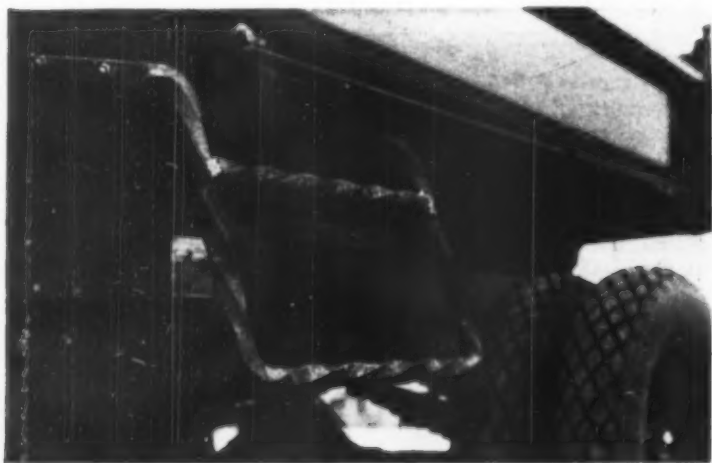


REMOVAL OF OLD DECK exposes stringers to which transverse beams of prefabricated floor units will be welded.



TO HARD-SURFACE WORN PARTS of shovel dipper, welder deposits metal from manganese base electrode. When using Harnischleger Harcote self-hardening electrode to surface dipper teeth, recommended procedure is: (1) Anneal tooth points to remove hardness where welding is to be done; (2) overlay top face 2 in. and under face 3 in. to avoid ending both welds in same place and guard against tooth breakage; (3) overlay sides 2½ in. back from point of tooth.

HOLLOW TILE FILLER (right) reduces dead load of concrete sidewalk on bridge carrying express highway between East St. Louis and Alton, Ill., over intersecting railroad tracks. George B. Richardson, contractor, for Illinois Division of Highways.

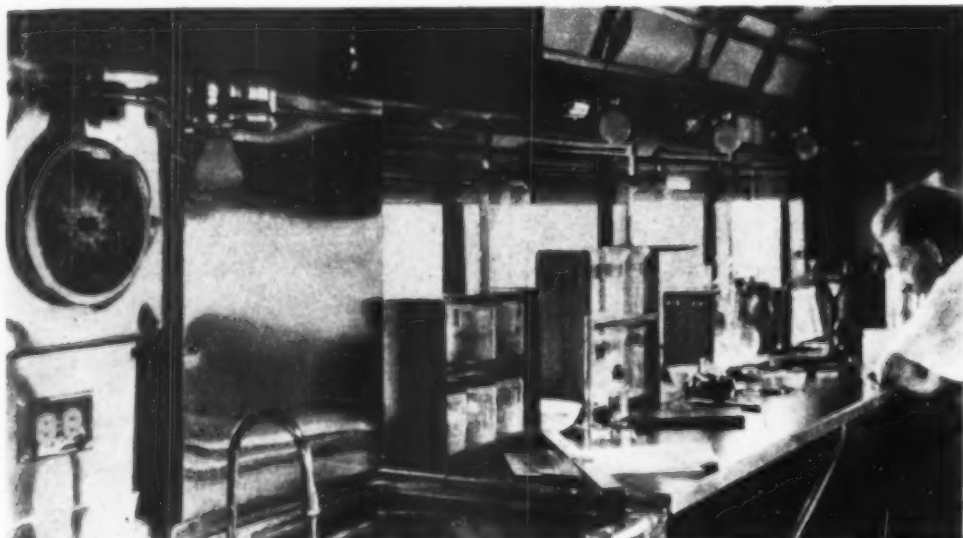


PREVENTING ACCIDENTS to men entering and leaving truck beds, District 18 of Texas Highway Department fashions safety steps from salvaged reinforcing steel and bolts them to underframe members.

HOW *They Do It*

CONSTRUCTION DETAILS

For
Superintendents and Foremen



LABORATORY ON WHEELS (left and above) enables engineers of Maryland State Roads Commission to make quick field tests of soil from local pits and bituminous mixes on road stabilization operations. Carried on special trailer with 22-ft. long chassis, mobile laboratory has own light and power plant, running water and complete equipment for testing sample and giving results in less than an hour.



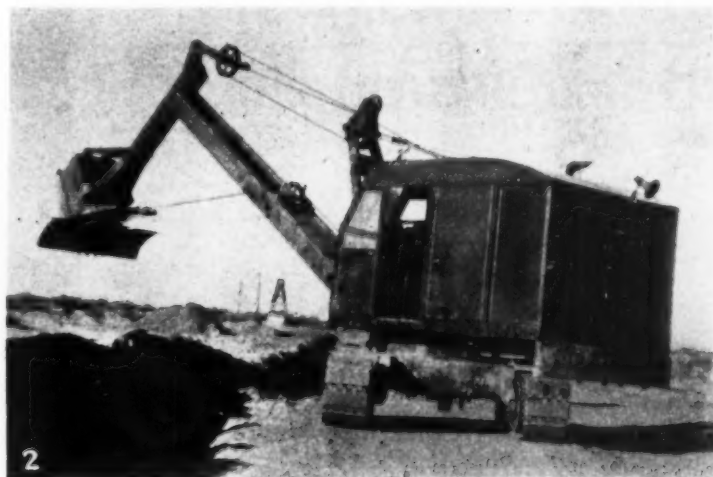
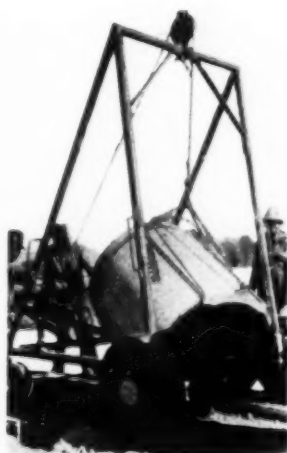
UNPERFORATED ACOUSTIC PANS form false ceiling covering ducts installed along 11,950 ft. of corridors as part of \$1,000,000 air-conditioning system recently completed in headquarters building of E. I. du Pont de Nemours & Co., Wilmington, Del.



TO COMPACT FILL MATERIAL next to cutoff wall of Deer Creek dam being built by Rohl-Connolly Co., Los Angeles, for U. S. Bureau of Reclamation on Provo River, Utah, constructors use loaded dumper truck capable of maneuvering and traveling in either direction with equal speed and facility.

Special Tools BUILD IRRIGATION PIPE LINES

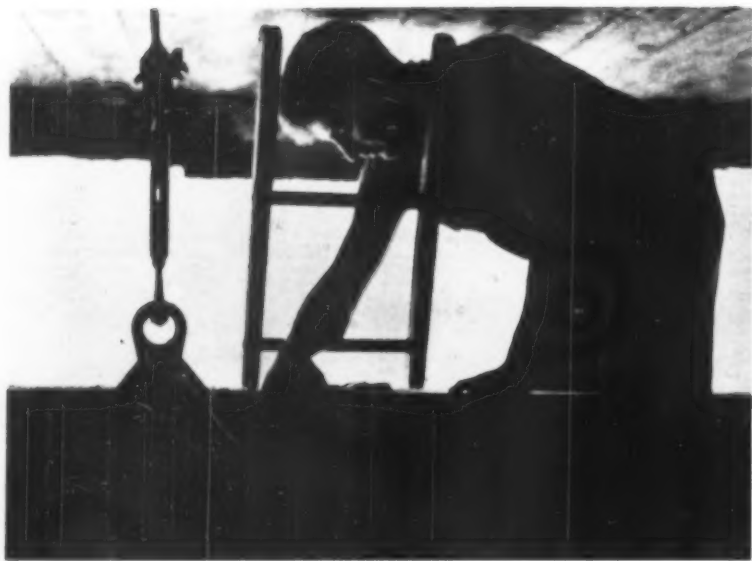
Photos from
L. M. ARMSTRONG,
Assistant Engineer,
U. S. Indian Irrigation Service,
Mesa, Ariz.



(1) **PIPE-HANDLING BUGGY** turns precast pipe on side as soon as concrete is hard enough to permit removal of bottom rings. Pima Indians perform work under Government supervision. (2) **AFTER PIPE** has been laid, versatile trench hoe backfills trench with blade fitted to bucket. (3) **TO CUT ROUND BOTTOM** in trench to exact outside diameter of pipe, providing



120-deg. bearing, excavator pulls this homemade rooter and slicer. (4) **THREADED TIERODS** fasten homemade blade to bucket of trench hoe. Irrigation system delivers water from dam on Verde River to 8,000 acres of Salt River Indian Reservation, Arizona.



Step-by-Step Field Methods

INVERTED I-BEAM TROLLEYS ROLL FALSEWORK STRINGERS FORWARD UNDER BRIDGE DECK

THREE I-BEAM TROLLEYS, built to order to fit the flanges of 24-in. I-beams, simplified the handling of 40-ft. stringers used to support deck forms on three flat-slab overflow bridges, totaling 1,900 ft. in length, built by the Lewis & Frisinger Co., Ann Arbor, Mich., contractor, under the direction of C. F. Replogle, superintendent, for the Ohio Department of Highways. Photographs reproduced on these pages illustrate the form system and method of moving stringers under three-span continuous slab units of one overflow bridge, designed with concrete bents resting on cast-in-place uncased pipe piles. The same trolleys and crane served to move similar I-section girders used with duplicate form systems under three-span continuous units of two other bridges supported on copper-bearing steel H-pile bents. Span lengths and slab thickness on the steel-pile bridges are slightly less than on the concrete-pile structure, but the deck forms were identical.



1 **CONTINUOUS REINFORCED SLABS** covering three-span units of overflow bridge are concreted monolithically on deck forms blocked up from transverse steel joists supported by 24-in. I-beam stringers 40 ft. long. Crane has removed forms and joists from end span in foreground. As I-beam stringers exceed maximum span length by 7½ ft., contractor is faced with problem in handling them from under deck and moving them forward to position for next three-span unit.

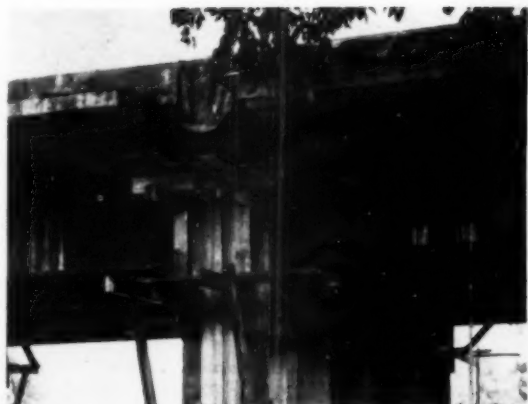


5 **WHEN READY TO ROLL** first set of I-beams ahead, workman crawls out to center of end span to attach turnbuckle to projecting eyebolt cast with embedded nut and washer in underside of concrete slab.

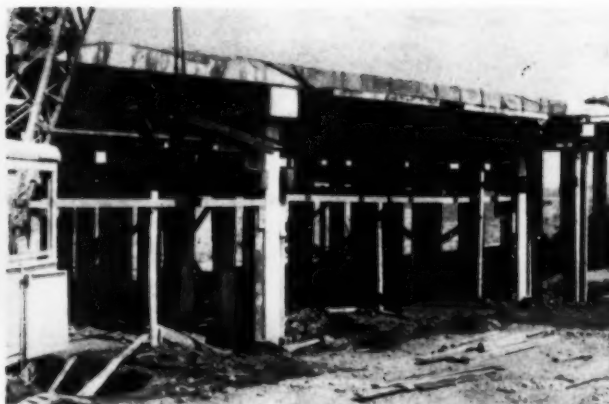


9 **AS HAULING LINE** from crane boom pulls I-beam forward on inverted trolley to falsework bent, workman goes aloft to slip another trolley on upper flange.

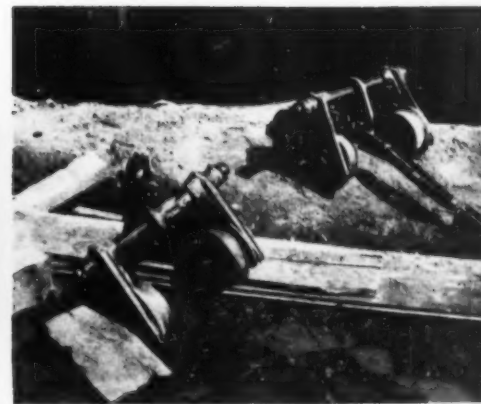
10 **WITH GIRDER DRAWN FORWARD** to center of final span, man on beam pins turnbuckle to eyebolt and picks up load by turning threaded screw link of turnbuckle.



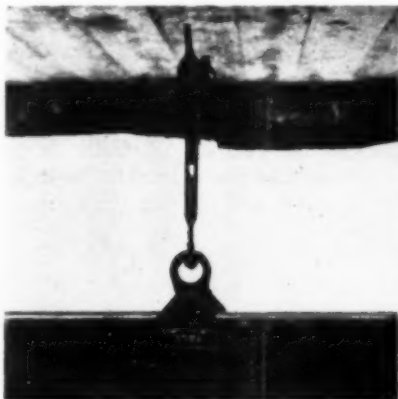
2 SUPPORTED BY TIMBER BENTS resting on bolted steel channels on construction offsets cast below finished grade at bases of columns, I-beam stringers carry form system on end spans, and timber connecting stringers close gap between I-beams under center span. Overall length of three-span unit, including 4-ft. cantilevers at both ends, is about 97½ ft.



3 AFTER REMOVING DROPPED PANEL FORMS from under deck, crane snakes out 18-in. 25-lb. joists 18 ft. long. Two 12-in. I-section joists, end to end, project beyond deck 33 ft. wide to permit bracing edge form for concrete slab of uniform 17½-in. depth.



4 I-BEAM TROLLEYS especially built to fit flanges of 24-in. I-beams and equipped with turnbuckle hangers are used in inverted position to roll steel stringers forward.



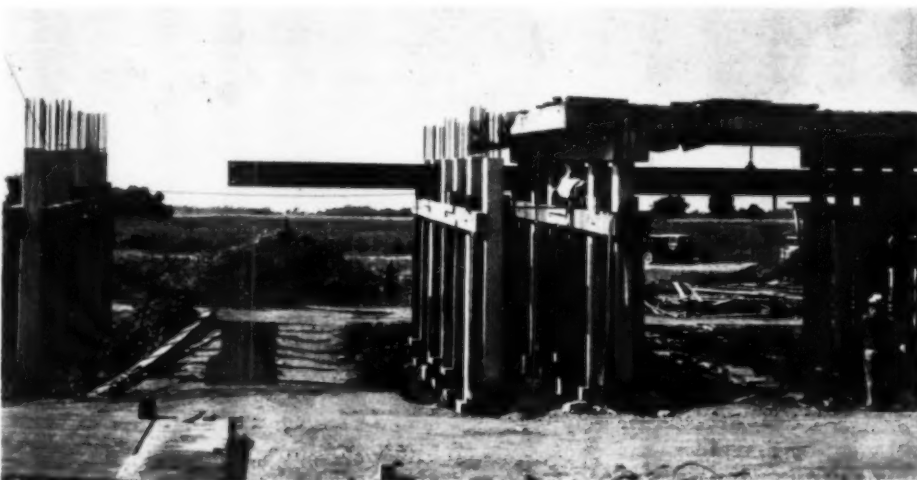
6 TURNBUCKLE pinned to eyebolt is drawn up to take load of I-beam off timber bents, ready for rolling ahead.



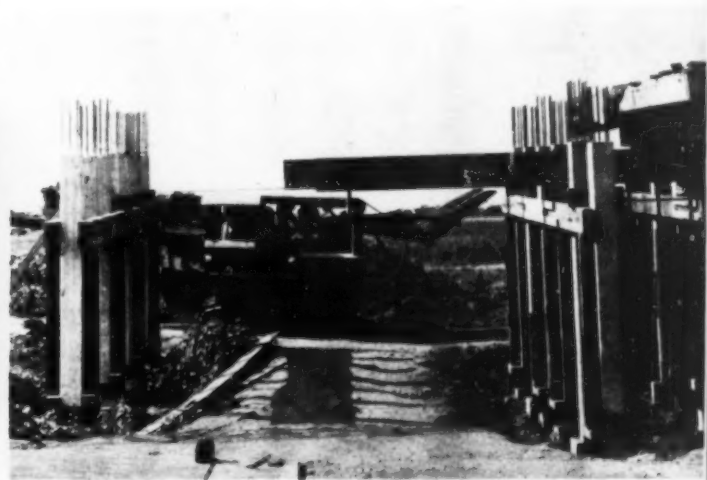
7 AFTER DRAWING I-BEAM forward on trolley rollers and snaking it clear of completed structure, crane carries steel stringer to position under end span of next three-span unit in overflow bridge.



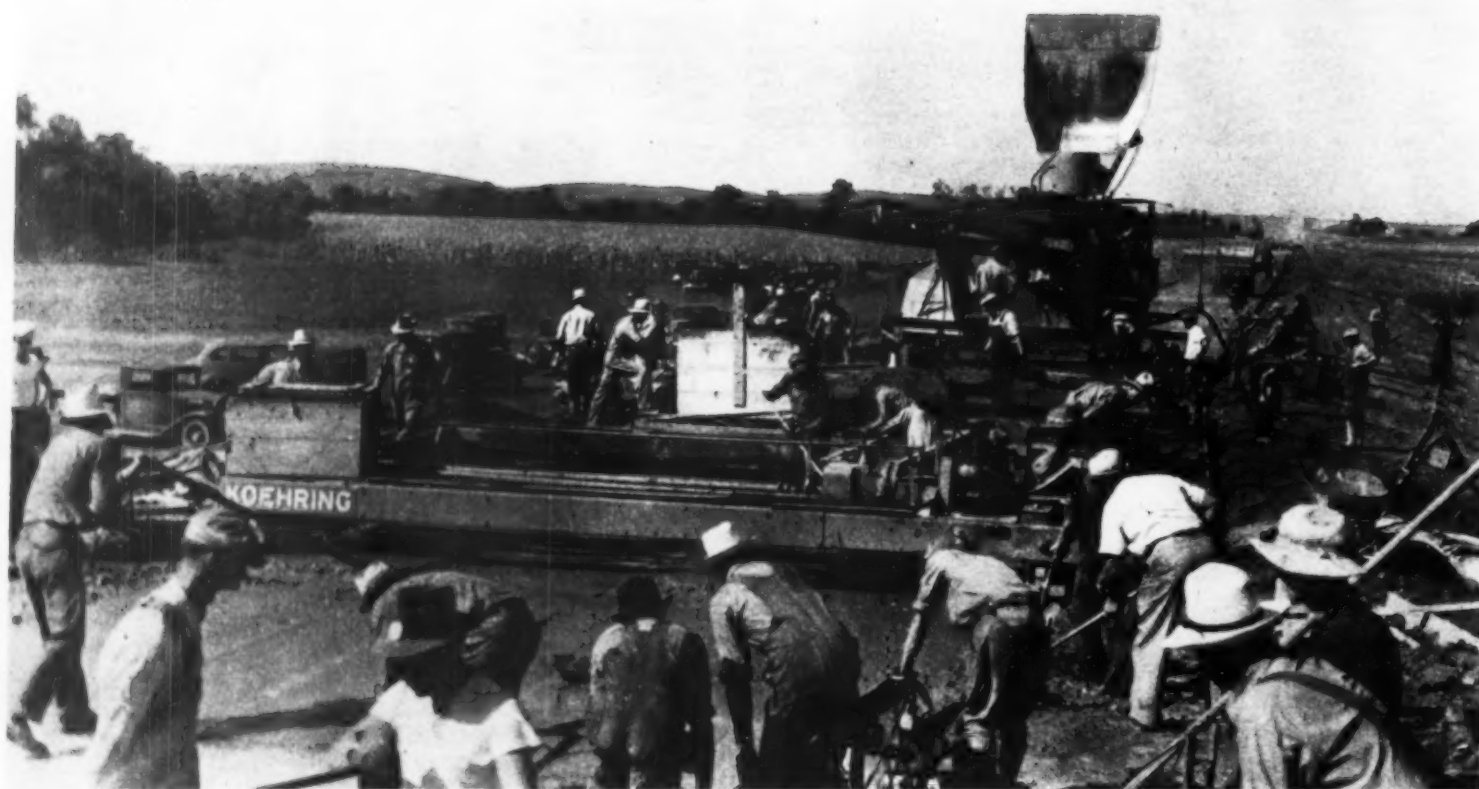
8 HAVING MOVED final I-beam in first span, inverted trolley is ready to be taken down and re-used in moving second set.



11 RIDING ON FINAL TROLLEY, I-beam slides forward to double bents supporting ends of continuous-span units.



12 PULLING LINE reeved through idler sheave draws I-beam as far forward as it can go without overbalancing. From this position girder can easily be picked up by crane and moved ahead some 20 ft. to final location.



FAST PAVING PROGRESS by 34E dual-drum mixer averaging more than 2,500 lin.ft. of 20-ft. slab per day completes 14.8-mi. project before freezing weather

CONCRETE PAVING DONE AT *Record Pace* IN SOUTH DAKOTA

By MORRIS E. ADELSTEIN,
President, Northwestern Engineering Co.,
Rapid City, S. D.

AWARDED A \$376,000 CONTRACT at the end of July for 174,000 sq.yd. of concrete paving on 14.8 mi. of U.S. 77 running south to the state line from 2 mi. outside Beresford, S. D., the Northwestern Engineering Co., contractor, Rapid City, S. D., completed the slab in 31 working days with a high-speed outfit, built around a 34E double-drum mixer, which equalled or broke all paving records for the state. The entire project, including earth shoulders covered with plant-mix stabilized gravel, was accepted by the South Dakota Highway Commission on Nov. 17, with only 60 days consumed of 120 days allowed for completion of the contract, eliminating any need to worry about a \$50 per day penalty for non-completion in the specified time.

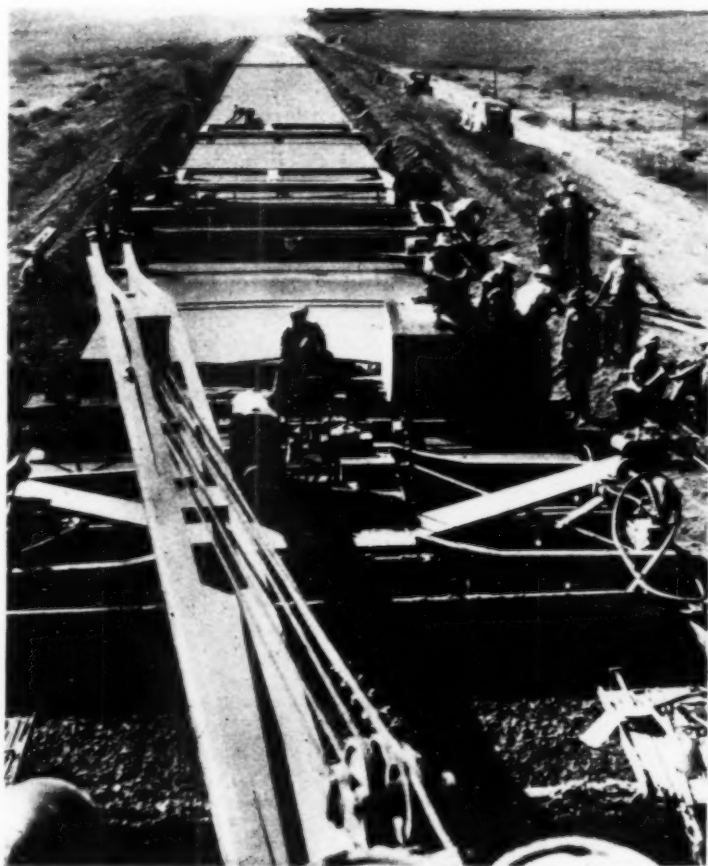
Paving Progress

To complete the project within the 1939 working season, the paving outfit was organized to operate at the highest possible speed and efficiency. Starting operations on the project Aug. 23, the outfit maintained an average of 2,522 lin.ft. of 20-ft. slab per day. Credit for this performance is due to the type of equipment used, to the close cooperation of all men connected with the project and to ideal weather conditions.

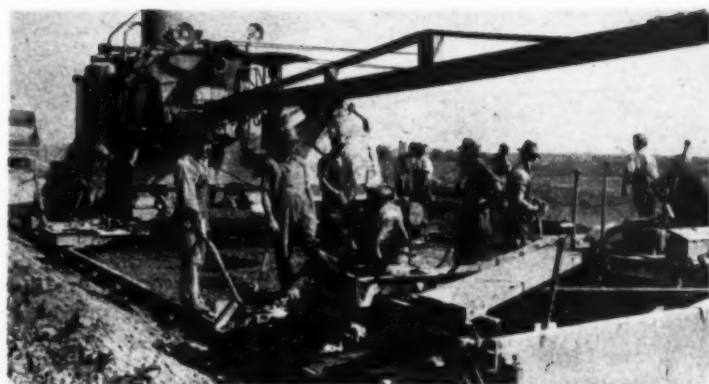
Operations started with two 7-hr. shifts per day, which because of colder weather and diminishing daylight hours later were cut to two 6-hr. shifts and finally to two 5-hr. shifts. Concrete paving was completed on Oct. 3, despite several days lost on account of rain, dust storms and cold weather. On the



FOUR SIZES OF AGGREGATE require two double compartment bins charged by 2-yd. crane.



FROM TOP OF PAVER. observer looks down on finishing machine followed by joint cutter and mechanical longitudinal float.



LONG BOOM ON 34E PAVER spreads second course of concrete on top of mesh reinforcement.



LOOKING AHEAD FROM TOP OF PAVER. camera catches line of two-batch trucks ready to supply mixer as soon as paving starts.

best day, an unusual run of 3,460 lin.ft. in 14 hr. was made. Other typical high-production days were those in which 3,164 lin.ft. was placed in 12 hr. and 2,796 lin.ft. in 10½ hr. The slab was of 9-6-9-in. cross-section, with the thickness increasing from 6 in. to 9 in. in a distance of 4 ft. at each edge.

On the best 14-hr. day the paver mixed 1,031 batches, an average of 73.6

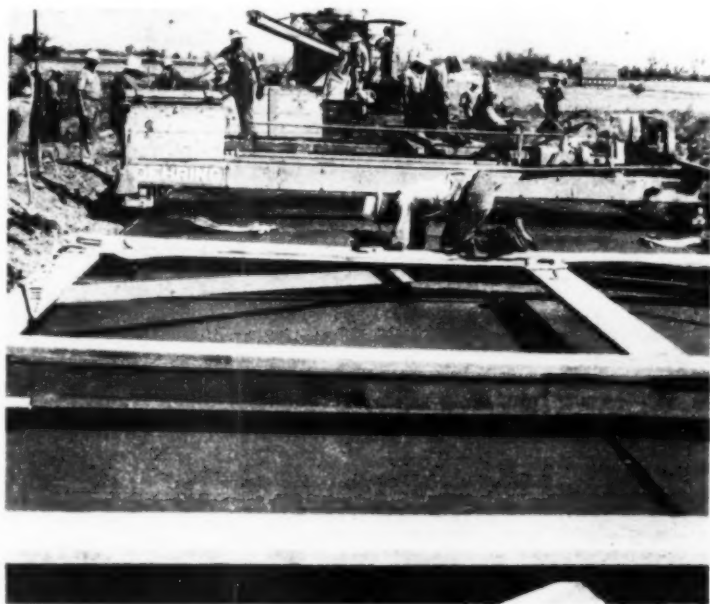
batches per hour. For the entire job, the average output was 60.8 batches per hour. The mixing time for each batch was 60 sec., including transfer time from the first to the second compartment. Dry weight per batch was 5,289 lb.

Contractor's Equipment

Practically every piece of equipment

on the project was new. The machines included an Allis-Chalmers tractor, a Lakewood scarifier, a Caterpillar No. 12 auto patrol and, at times, a Caterpillar RD7 tractor with an 8-yd. LeTourneau scraper. Form trenches were cored with a Carr formgrader, and forms were tamped in place with a Jaeger form

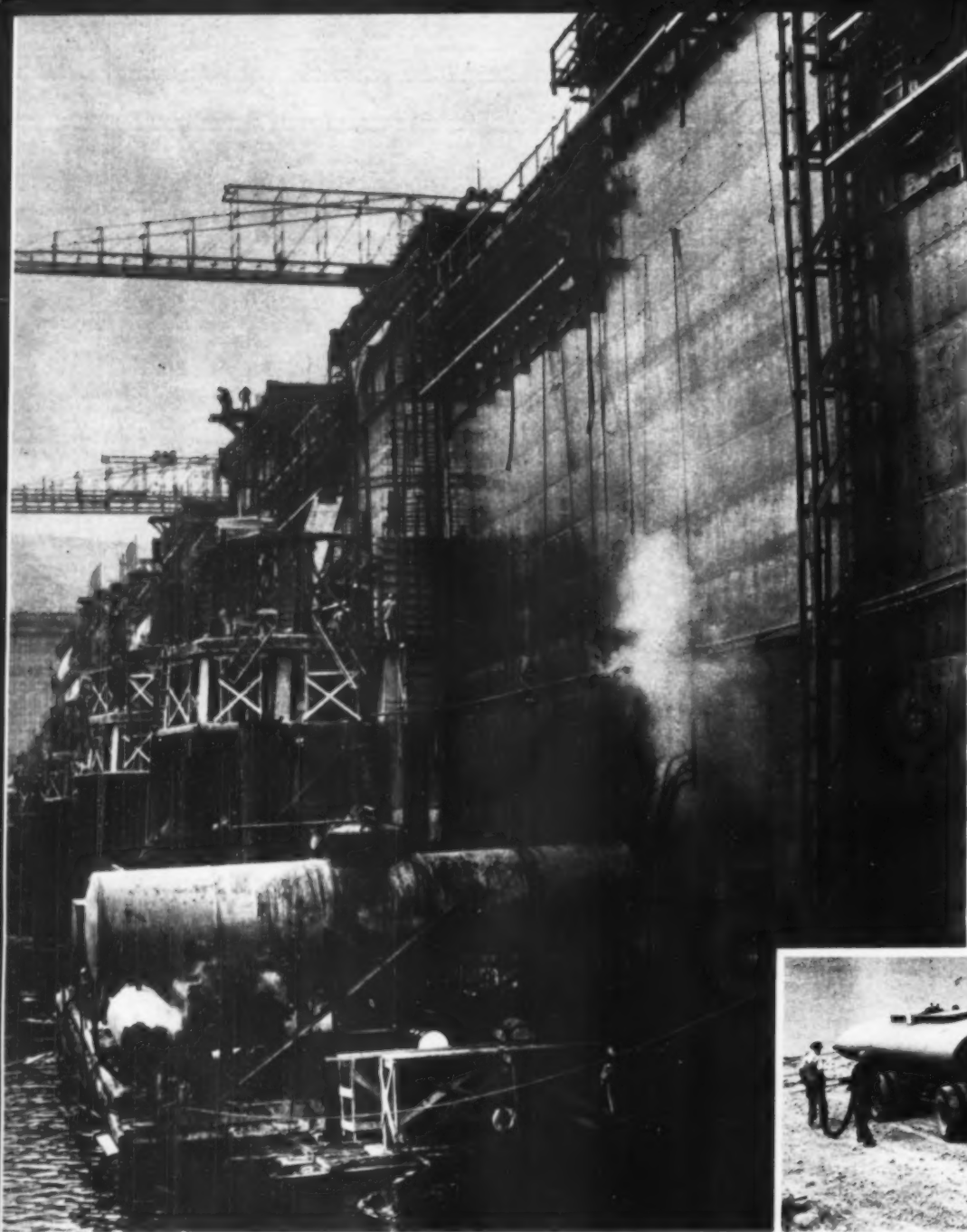
(Continued on page 91)



ROLLING BRIDGE aids hand finishing at joints. Beyond bridge is longitudinal finisher taking out final irregularities to assure smooth-riding surface.



AMONG THOSE cooperating to maintain good progress on job are (left to right): Inspector Alguire of South Dakota Highway Department; J. J. Taaffe, concrete superintendent; "Pee-Wee," assistant inspector; and Nels Veflin, mixer foreman.



STEAM BOILER BARGE "Iron Duke" floating on upstream side of dam delivers steam through pipes suspended along face.

WITH THE AID OF STEAM HEAT, concrete placing at Grand Coulee dam continues after air temperatures have fallen below the point which otherwise would signal the shutdown of the mixing plant. Steam is delivered to all parts of the job in pipes fed by a steam boiler barge, the "Iron Duke," floating alongside the upstream face of the dam. On this barge, several steam boilers with a total capacity of 1,000 hp. burn fuel oil brought to the job in tank trucks and delivered to a storage tank on the "Iron Duke" via a fuel barge.

Steam hoses from the boilers connect to manifolds of an insulated steam piping system which delivers steam inside of temporary canvas inclosures. Steam delivery is watched carefully to prevent overheating until concrete has set.

In mass concrete in the dam, the contractor is permitted to use 1 per cent of calcium chloride (furnished by the Government), provided water and aggregate are heated. Canvas inclosures are used, and a layer of sand is placed on

(Continued on page 93)

FUEL OIL (below) is delivered from tank trucks to transfer barge which transports oil to floating steam plant.



SHUTTLE SERVICE (below) for oil delivery is rendered by transport barge carrying fuel from shore to floating boiler plant in background.

FLOATING PLANT SUPPLIES *Steam Heat for Winter Concrete* AT GRAND COULEE



Present and Accounted For

A PAGE OF PERSONALITIES



HOWARD L. KING, chief engineer of Mason & Hanger Co., Inc., of New York, contractor for recently completed Lincoln tunnel under Hudson River and for Lackawack dam, just getting under way for New York City's Delaware River water supply, received last month the Construction Engineering Prize of American Society of Civil Engineers for his paper, "Subaqueous Tunnel Construction."



JOHN W. COWPER, president, John W. Cowper Co., contractor, of Buffalo, N. Y., and past-president of Associated General Contractors of America, has been elected chairman of Joint Conference on Standardized Construction Contracts, revived by A.G.C. to consider changes in contract procedure in light of present day conditions. Participating in conference are eight national organizations of civil, waterworks, railroad, highway engineers and architects.



TO HEAD CONSTRUCTION CENSUS. Here are Department of Commerce representatives who will direct work of Construction Division of 1940 Census of Business, now getting under way. Pictured on a recent vacation trip, they are: ISAAC Q. LORD (left) chief of construction division and FRED A. GOSNELL, director of entire Census of Business.



AT FRIANT DAM U. S. Bureau of Reclamation project in California on which construction work was begun recently on \$8,715,358 contract by Griffith Co. and Bent Bros. R. B. WILLIAMS (right) construction engineer, confers with JAMES H. WARNER (left) supervising engineer and A. A. WHITMORE, resident engineer.

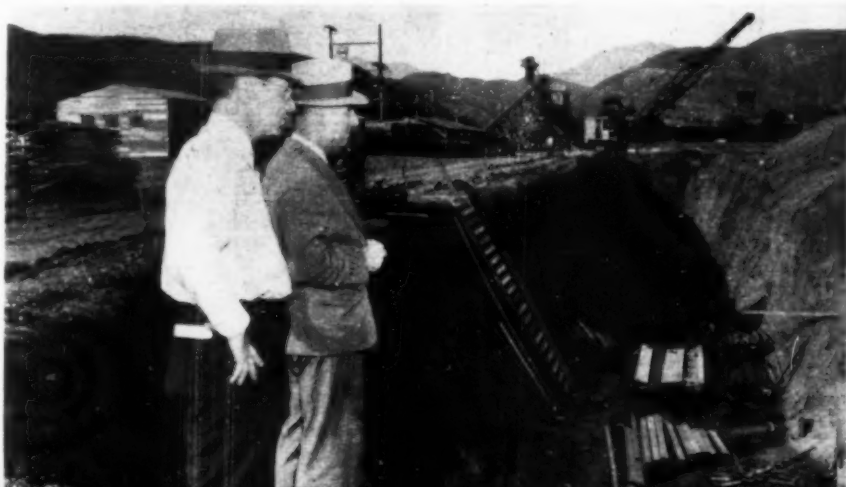


VETERAN CONTRACTOR is A. S. FRY, surviving member of Fry & Kane, of Lansing, Mich., one of older contracting firms. Mr. Fry's latest project is a 46-in. concrete pipe line in city section of a 30-mi. line, with two high-head pumping plants, to bring Lake Michigan water to Grand Rapids, Mich., involving a cost of \$4,100,000.



DISTRIBUTION SYSTEM (left) of Colorado River aqueduct in California, serving Los Angeles and twelve other cities of Metropolitan Water District, is chief responsibility of R. B. DIEMER (at right) distribution engineer and B. H. MARTIN resident engineer, who are here inspecting water softening and filtration plant near La Verne.

BRIDGE BUILDERS CONFER. On Mississippi River crossing, \$8,361,000 steel cantilever at Baton Rouge, La., E. L. ERICKSON (left) is assistant bridge engineer for Louisiana Highway Commission and E. L. DURKEE is resident engineer for Bethlehem Steel Co., contractor for superstructure.



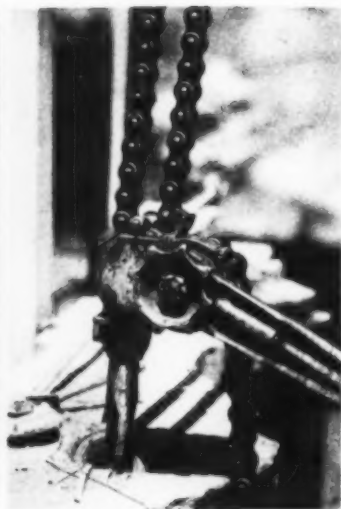
SMALL TOOLS ON CONSTRUCTION



6



1



1 RAISING OF FORMS at Grand Coulee dam, in Washington, is done with ratchet-operated pull hoists (Yale & Towne) rigged on job-made A-frames made of welded pipe lengths, which are light enough for easy shifting to new set up. Equipped with roller chain, hoists have self-actuating load brake of screw and disk type.

2 REVOLVING BOOM HOIST operated by hand winch (Sasgen) places diaphragm pump to unwater steel cylinder caissons for bridge foundation in Virginia. Contractors are Virginia Engineering Co. and Tidewater Construction Co.

3 THIN ABRASIVE WHEEL on portable electric groover (Wodack) removes old mortar from joints of brick parapet wall prior to repointing. Shoe is adjustable for cutting depths up to 2 in. Cleaner with removable pads filters dust from air that goes to motor.



2



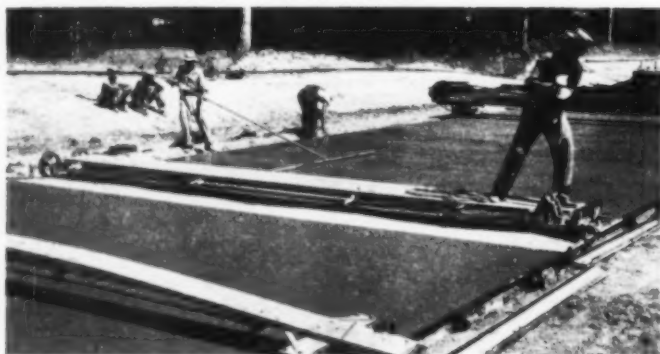
3

4 GAS FURNACE melts solder for plumbers on Queensbridge Houses, New York City, where Jarcho Bros., Inc., plumbing contractor, uses about 30 of these heating units (Insto-Gas). According to plumbers on job, furnaces burning non-explosive gas supplied in charged cylinders are cleaner and more convenient than older types. Wind does not blow out flame. Charged cylinder is rated to burn 30 hr., plumbers count on 24 hr. of heating service. Hose connection can be attached to cylinder to permit use of hand soldering unit at distance from source of fuel.

5 HAND-POWERED BELTING MACHINE follows mechanical longitudinal float behind two finishing machines on high-speed paving job of Mid-West Construction Co., Chicago, for Indiana Highway Department, building divided four-lane highway on U. S. 40 relocation between Brazil and Terre Haute, Ind. (Cleveland Form Grader Co. belting machine.)

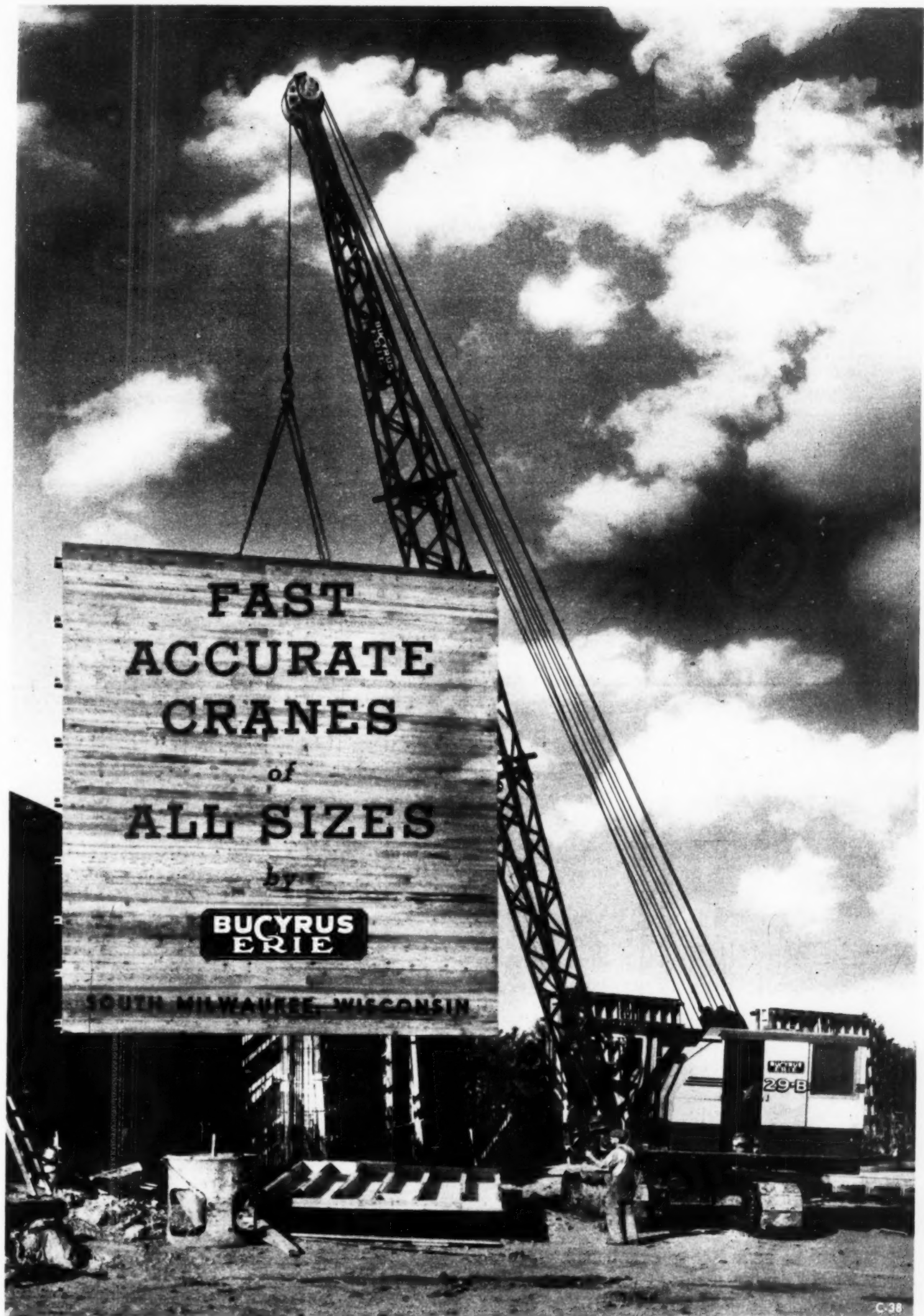


4



5

6 RADIAL ARM SAW with 8 1/2-in. diameter blade is powered by 1-hp. variable speed air-cooled portable gasoline power unit weighing only 55 lb. Depth of cut, 2 3/4 in. Saw attachment has adjustment for 45-deg. bevel cuts. Radial arm has working range of 28 in. Saw handles cross-cutting, ripping, mitering and either straight or bevel cuts.





to Small Job ECONOMY

•The Monotube Method of Pile Construction assures quality substructures at a cost in keeping with their size. Here's why:

1. Monotubes of many sizes and tapers can be obtained in small quantities without paying a premium.
2. Monotubes are light weight and can be shipped and handled at low cost.
3. Monotubes require no core or mandrel—can be driven with standard equipment obtained in your own locality.
4. Any competent contractor can install them.
5. Inspection is easy and inexpensive—a light lowered into the driven casing affords proof of its integrity.
6. Filling the Monotube with concrete is a simple operation, and the completed pile has the combined strength of the concrete and steel.

Specify Tapered Steel Monotubes for that next job, small or large, and get a safe substructure at a saving. Write for Catalog No. 68A.



THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

CONSTRUCTION EQUIPMENT NEWS

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Review of Construction Machinery and Materials for FEBRUARY, 1940

POROUS CONCRETE DRAIN PIPE for surface and subsoil drainage, water collection and irrigation provides serviceable underdrains for highways, airports, athletic fields, parks, tunnels and reclaimed lands. Outstanding feature is that water drains into pipe through porous walls instead of through joints as is customary with ordinary drain pipes. Joints are tongue and groove, fitted snugly together; they do not have to be left open for water to enter. Pipe available in following sizes: 4-, 6-, and 8-in. diameters in 2-ft. lengths; 10-, 12-, 15-, 18- and 24-in. diameters in 3-ft. lengths. To give pipe solid bedding in trench and prevent rolling or shifting about while being installed, outer wall shape on 4-, 6-, 8-, and 10-in. sizes



is angular (hexagonal or octagonal), and outer wall on sizes above 10-in. is corrugated. Pipe is made up from semi-dry mixture of: (1) portland cement, (2) washed sand or granulated slag sand and (3) blast furnace slag or crushed stone or gravel; finished product is cured by live steam or by water spray. According to manufacturer, laboratory tests give average infiltration of 2 gal. of water per minute per inch of diameter per pipe length: for example, 4-in. pipe has 8 g.p.m. infiltration, and 6-in. pipe has 12 g.p.m. Pipe recently unearthed from installations made in 1927 and 1928 is said to have retained its free-flowing condition with original porosity unimpaired. For ordinary underdrainage, pipe is placed in trench surrounded on two sides by about 4 in. of broken stone or gravel and covered on top with same material to depth of 6 or 8 in. Concrete in pipe walls is said to possess uniform texture and to exceed compressive strength of 2,000 lb. per lin.ft. of pipe under three-edge bearing test. — **Concrete Porospipe Corp., 325 Eleventh St., Carlstadt, N. J.**

★ ★ ★

GENERAL SERVICE TRUCK, used by Baltimore Transit Co., for trouble shooting, repairing power lines and replacing derailed cars, is equipped with power winch, steel wrecker derrick and two-section hydraulic repair tower, platform of which is equipped with 36-in.-high gates. Tool boxes in floor of platform. — **Gar-Wood Industries, Inc., Winch Division.**



CENTRIFUGAL PUMP has as its principal feature a single compact frame which not only supports pump unit, but also fully inclosed, self-protected electric motor. This frame is so constructed that water or other liquid being handled is passed around thin tubular shell of motor providing definite and continuous cooling. Advantages claimed for this mounting: predetermined operating temperatures assuring maintenance of motor power; continuous cooling; fully inclosed; moisture-, shower-, dust-, splash-, and drip-proof features. Unit may be mounted in any position. Powered by Sawyer Hi-Power



tubular-type motor $\frac{1}{2}$ to 10 hp., handling from 20 to 200 g.p.m. and operating on temperatures to 200 deg. F., or more, and heads up to 250 ft. Motor shaft is carried on two ball bearings, easily accessible, yet rigidly and compactly mounted in single frame. Perfect alignment maintained by mounting impeller

MAKES EXCAVATOR HISTORY AT 1940 ROAD SHOW

New P&H Machine is Center of Attraction

CHICAGO, Ill.—Today, as thousands jammed the International Amphitheatre for the opening of the largest road show on record, visitors were given a preview of the excavating equipment of the future, as exemplified by a new P&H 1½ yard, Diesel powered shovel, exhibited by the Harnischfeger Corporation of Milwaukee.

Hundreds of contractors, from all over the United States, took their turns at the control levers of a demonstration model to learn, firsthand, of the new ease and simplicity 1940 brings to shovel operation.

Has New Type of Control For All Operations

Built entirely of alloy rolled steels for greater strength without unnecessary weight, welded for the utmost in rigid construction to withstand continuous high-speed digging, this machine also has a new type of control, used for the first time on any excavator. According to officials of the Company, control not only simplifies

If you can't join the crowd at the P&H Booth (No. G-7) to take your turn at the control, ask P&H to send you Bulletin X-61.

General Offices, 4494 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER

CORPORATION

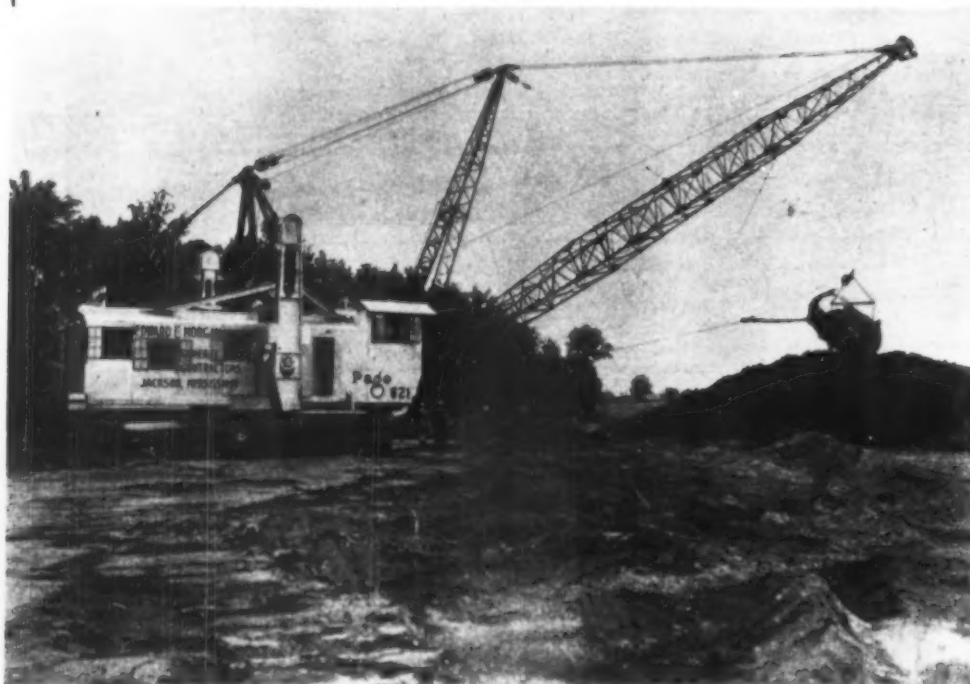
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HOISTS • WELDING ELECTRODES • MOTORS

More Yardage— More Profit—with a Page Walking Dragline

*Diesel or electric powered Draglines
3½-cubic-yard capacity and larger*



Edward E. Morgan Company used this Page Walker on levee work along the Wabash River near Vincennes, Indiana. The machine was shipped with a 125-foot boom and a 6-cubic-yard Page bucket.

Because Page Walkers are completely modern, fast dragline machines they are establishing new yardage and profit records for their users.

Rugged design plus the Page Diesel engine assures low maintenance and operating costs. Moreover, the large circular base and the positive crank-action walking mechanism give more freedom from ground and weather conditions and permit immediate movability in any direction.

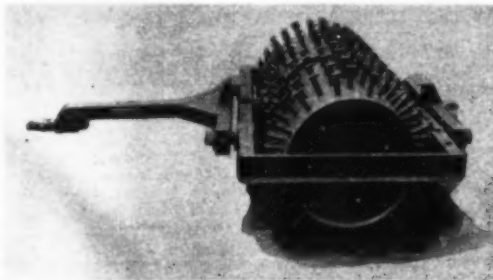
Before buying any dragline learn all about a Page Walker in a size suitable for your job.

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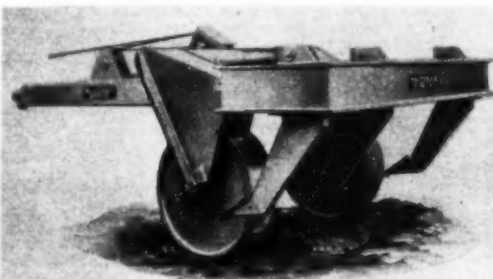
of pump directly on motor shaft. Extra large outlet pipe said practically to eliminate discharge losses. —Smith Meter Co., 5743 E. Leneve St., Los Angeles.

★ ★ ★

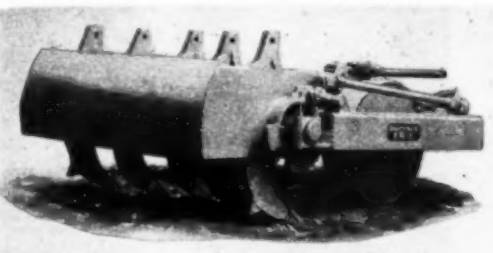
TAMPING ROLLERS and two types of rippers are recent additions to Bucyrus-Erie line of tractor equipment. Rollers are offered in single, double or triple drum models, each drum being fitted with 72, 96 or 112 feet. All rollers have rear pull connections for working in trains and all drums are provided with openings for ballast. Double- and triple-drum models have oscillating drums which permit rollers to adapt themselves to uneven ground surfaces. Tamping feet, when worn may be removed and replaced with new ones. Rippers are of two types,



rotary and heavy-duty cable operated. Feature of rotary ripper is rotating head which quickly swings ripping standards up, back and around to ripping position again and which is said to make machine particularly effective for work in areas containing



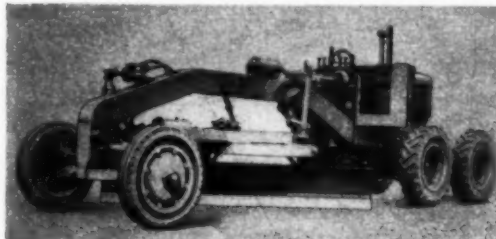
boulders and heavy roots. Complete rotation of head also dislodges rock and debris caught between standards and prevents ripper from picking them up again. Cable-operated ripper for breaking up hard-digging, hard-loading materials, such as hardpan, decomposed granite, sandstone and old



macadam. Controlled by cable operated from tractor winch, standards on this ripper said to be able to penetrate 17 to 24 in. below ground level. Standards may also be set at intermediate points and raised above ground for traveling. Self-sharpening ripping points are renewable when worn.—Bucyrus-Erie Co., South Milwaukee, Wis.

★ ★ ★

MOTOR GRADER, 46 hp. for road building and construction work as well as maintenance, repair and snow removal, is machine of intermediate weight



and power said to combine economy in original investment and operation. Powered by 46-hp. gasoline engine mounted over rear axle. Full hydraulic finger-tip controls. Usual size blade with complete range of adjustments in all working positions. —Galion Iron Works & Mfg. Co., Galion, Ohio

Quick, COMPLETE TURNS CUT DIRT-HAULING COST!

*Save time on narrow
fills and roads . . .*

Short turning radius of the Koehring Trail-Dump cuts your dirt-hauling costs — you can make complete, continuous turns on narrow roads and fills. Time is saved — back and forth maneuvering is eliminated — complete turns can be made on 21 foot wide fills or roads — sharp turns of greater than 90° — costs are cut because seconds are saved on every trip. Other important time-saving features are, instantaneous dump, easy loading body, high speed pneumatic-tired tractor, positive quick-closing doors.

KOEHRING COMPANY
MILWAUKEE, WISCONSIN



HEAVY-DUTY CONSTRUCTION EQUIPMENT

Another "Dry One" by . . .



Moretrench!

The high cost of fighting water didn't have a chance on the WPA Sewer Project pictured here. From start to finish a MORETRENCH WELLPOINT SYSTEM kept the trench bone dry, insuring a steady daily progress and an unestimated saving of time and money.

WE CAN DO THE SAME FOR YOU!
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Any man who uses one will tell you the Haiss Bucket is TOPS today!

And every man who has watched one work says "Haiss for me, too, next time." Wire or write for prices and catalog.

HAISS
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FOR PAY LOAD CLAMSHELL DIGGING

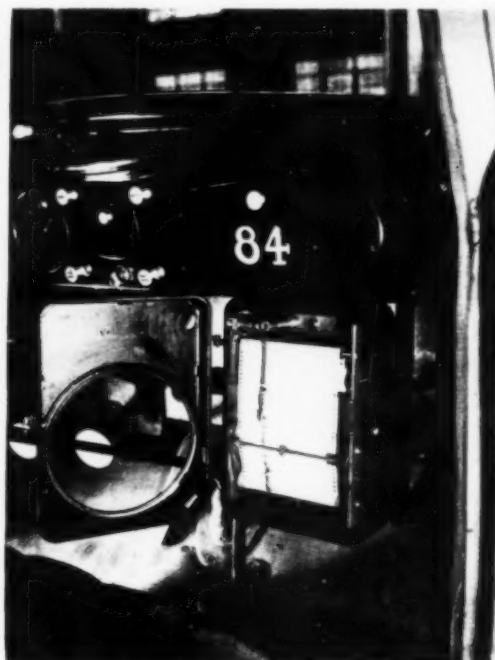
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In stock at New York, Philadelphia, Baltimore, Atlanta, Hartford and Los Angeles
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WOOD PRESERVATIVE AND WATER REPELLANT. named Permodip, applied by brush or spray gun to surfaces of studding, sills, joists and other housing lumber contains four toxic materials designed to provide chemical barrier against deterioration from moisture, fungus or termite attack. By controlling moisture content of wood, shrinking and swelling are reduced, thus eliminating warped floors, rattling windows and sticking doors. Application of preservative is said to produce no crystallization on surface of wood, and acts as a primer for painting. Dries sufficiently for painting in 12 hr. and leaves no oily film. Bulletin describing product contains chart illustrating vital areas in frame buildings, for which application of Permodip is recommended.—E. & F. King & Co., 405 Atlantic Ave., Boston, Mass.

★ ★ ★

BUMP RECORDER called "Rulometer," designed to register bumps per mile has been constructed for purpose of measuring and recording relative roughness of roads. Machine is mounted under cowl at right-hand side of car, easily accessible to operator. Essential parts are linkage from lower knee action arm of left front wheel to instrument, pen and pen arm, numerical integrator, chart and chart drive mechanism. Vertical motion of knee action arm with respect to car body is translated into oscillating motions of shaft by connecting link and arm, which, in turn, is transmitted to 6-in. long pen arm which holds small fountain pen. Pen makes movement to right or left of neutral position directly



proportional to displacement of car body. Numerical integrator consists of small counter and over-running clutch connected to recording pen. Clutch drives integrator in one direction proportional to pen movement, thus integrating movements of pen, however small. Six-inch wide strip chart driven through recorder by drive roll and gear train is used for record. Chart has two optional speeds 1/4 in. per .1 mi. or 2 1/2 in. per mile and 1/4 in. per .01 mile or 25 in. per mile. Brief notes, later recorded on chart, are taken by operator during test. Charts then are taken to laboratory and marked off in mile sections. Identification information and number of bumps per mile are recorded on chart, which is then blueprinted or photostated.—Dow Chemical Co., 1014 Jefferson Ave., Midland, Mich.

★ ★ ★

BOTTOM-DUMP WAGON, crowned load, 8 cu.yd., struck measure, 6 1/2 cu.yd., especially suitable for elevating grader operation and for shovel, dragline and crane loading, is high speed flexible unit, mounted on pneumatic tired wheels, which travels, loaded, at various speeds as high as 20 m.p.h. Said to have more than ample load flotation and to haul efficiently over rough grades as well as improved roads. Wide body top opening facilitates loading and permits quick, easy spotting. Short turning radius (10 ft.) permits complete continuous turning on narrow fill, eliminating back-and-forth maneuvers. Free oscillating hitch from wagon tongue to tractor provides full universal action between tractor and wagon to reduce strains when traveling in and out of ditches or over rough grade. Free swinging, gravity impelled doors released by levers within convenient reach of operator, and "automatic

The Job You Want Done *Is Now Being Done*

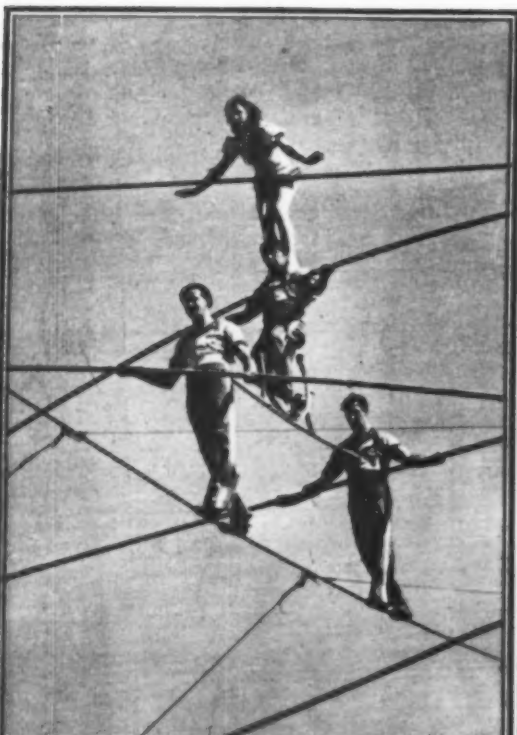
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Dependable
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MARCH 1st will make DIESEL HISTORY

MARCH 1st . . . the Cummins Engine Company will make an announcement of the most vital interest to every prospective purchaser of a diesel engine . . . an announcement that only the pioneer in diesel development *could* make.

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PERFECT BALANCE

The four tight rope walkers shown above, must have perfect balance to successfully perform their breath taking act. Just as their work depends upon this perfect balance so does the work of a shoveler depend upon balance in his shovel. Balance in a shovel means easier handling and more efficiency in shoveling. A new re-designed socket gives to the ABW Solid Shank Shovel a perfect balance. The new high bend has achieved for this famous shovel a balance unequalled in any other solid shank shovel.

New Redesigned Socket



Try This Test

Lay one of these new ABW Solid Shank Shovels on a table or desk, balance with the blade and socket projecting over the edge of the table, and the handle poised free of the table. Then tip the blade down to either side, release and watch the shovel right itself. This is the perfect balance which no other solid shank shovel has.

To users of shovels this is an important development and one that will be welcomed by buyers of shovels. In addition to this exclusive feature ABW Solid Shank Shovels are equipped with the famous Shock Band which gives more handle strength to the shovel. ABW Solid Shank Shovels are made from one solid bar of steel.

Ask your Jobber



ABW PRODUCTS

| | |
|---------|--------------|
| Shovels | Rakes |
| Spades | Post Hole |
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| Forks | Agricultural |
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AMES BALDWIN WYOMING CO.

PARKERSBURG, W. VA. • NORTH EASTON, MASS.



hand" for door closing permits quick dumping on fill at traveling speed and return to loading unit without stopping. Other features: Constant mesh transmission, oscillating front axle, monoplate steel body, and interchangeability of wagon with Wheeler body. For use with Koehring high speed tractors (2 gasoline models 4- and 6-cylinder, and one diesel model, 4-cylinder) which feature extra-size pneumatic tires, swiveling hitch, self-contained power unit, constant mesh transmission, oscillating front axle and spiderless type differential.—Koehring Co., Milwaukee, Wis.

★ ★ ★

LIGHT-WEIGHT SUPERCHARGED DIESEL ENGINES in 125-hp. and 200-hp. sizes for use in automotive hauling units and mobile equipment weigh only 10 lb. per horsepower, including weight of standard accessories such as fuel pumps and electric starters. Supercharger is small compressor or blower (belt-driven through slip clutch from front end of engine) which forces air under pressure through intake manifold, putting more air into each cylinder to improve combustion and increase pressure in piston during power stroke, thus boosting engine's power output



without appreciable increases in weight or dimensions over standard models. Both engines are six-cylinder four-cycle units; the smaller has 4-in. bore and 5-in. stroke and develops maximum horsepower at 2,200 r.p.m.; the larger is 4 7/8x6-in. and is rated 200 hp. at 1,800 r.p.m. Progressive injection of fuel into cylinders by mechanically operated plunger injector is said to eliminate "shock" combustion and to keep peak pressures within practical limits, resulting in smoother running, greater torque and higher efficiency. Supercharged engines are claimed to pick up full load without detonation or smoke and to give instant cold starting on diesel fuel without need of any auxiliary equipment except standard electric starter. — Cummins Engine Co., Columbus, Ind.

★ ★ ★

WHITEPRINT MACHINE, combining printing and developing in one unit, is equipped with new light source which provides printing speed up to 20 lin./ft. per minute. Variable transformer included in primary circuit of transformer, permitting variation of intensity of lamps from full brilliancy to 60 per cent of maximum without loss of energy. This "dimming" arrangement allows operator to select intensity re-

(Continued on page 74)

YOU'LL FIND THIS Mall GASOLINE POWERED VIBRATOR

BEHIND JOB WINNING
ESTIMATES IN 1940

SLASHES TIME, LABOR
CEMENT AND POWER COSTS



Pneumatic mounting provides unusual portability.



Placing concrete on heavily reinforced deck slabs.

You can seal your bids in 1940 with complete confidence if you have this fast and efficient MALL vibrator that places all types of quality concrete construction on a low-cost basis. It assures a denser, stronger, water-tight bond with reinforcement . . . prevents honeycombs and aggregate pockets and eliminates expensive patching. In addition, it permits the use of a low water-cement ratio concrete. A flexible shaft transmits power to the vibrator which delivers 3000 to 7000 frequencies per minute. No generator set is required. Attachments for SURFACING, PUMPING, SAWING, DRILLING and SANDING.

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THE OTHER PUMPS QUIT



Results mean more than words. Talk is cheap and anyone can make a lot of unproved claims. But on the job a pump must do its own talking. Try out a G & R pump and then you be the judge.



AGAIN THE CONTRACTORS BOUGHT GORMAN-RUPP

On the new Shore Parkway project at Brooklyn two centrifugal pumps one an 8-inch and the other a 4-inch, clogged and quit. Two "Can't Clog" G & R 6-inch pumps replaced the quitters and for weeks pumped 24 hours per day.

Gorman-Rupp Pumps Can't Clog. They are not quitters. That's why MORE CONTRACTORS ARE STANDARDIZING ON GORMAN-RUPP PUMPS THAN ANY OTHER MAKE. They will pump MORE WATER and pump MORE HOURS at LESS COST.

Let a Gorman-Rupp Pump prove these statements. Phone our nearest distributor for a trial pump.

THE GORMAN-RUPP CO. Mansfield, Ohio

The *Paymaster* is a STAR PERFORMER on any Material Handling Job

1
Lima Truck Crane
owned by
Harris Structural Steel
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Samuel Kraus Co.,
St. Louis, Mo., longtime
user of Lima excava-
tors is the owner
of this Lima
Paymaster.

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Cary Bros., Lima, Ohio,
using their Lima Pay-
master to unload sand
for The Ohio
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Chas. L. Harney, one
of San Francisco's leading
contractors, finds the
Lima Paymaster
much to his liking.

5
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Paymaster Drag-
line with 45' boom
and 1/2 yd. bucket.

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shovel, dragline, crane and
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of 3/4 cubic yard excavators. On
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winning new friends and keeping them by
giving the most in performance at lowest
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SHOVELS - CRANES - DRAGLINES - PULL-SHOVELS



Cletrac uses



Model RD Diesel Cletrac pulling a 10' disc in wet, sandy soil near Salem, Oregon.

Model AD Diesel Cletrac and loader rebuilding an old wagon road for use of trucks in bringing out logs at Ardy, Washington.

Model RD Diesel Cletrac and front end loader excavating a basement near Cleveland, Ohio.



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RPM DELO is available through distributors in more than 100 other countries. Get in touch with your nearest distributor.

Cletrac Diesels perform heavy continuous work the world over — this work demands a tough lubricating oil

New "RPM" Diesel Engine Lubricating Oil now available everywhere in the gray barrel with the blue head

Unequaled
FOR EVERY
DIESEL

RPM
DIESEL ENGINE
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NEW RPM DELO

(Diesel Engine Lubricating Oil)

in crankcases
of all Diesels
leaving factory

OFFICIAL ADVICES from the Cleveland Tractor Company:

"We endorse New RPM DELO as a superior lubricant for the *Hercules and *Buda Diesel Engines which power Cletrac Tractors. We have made arrangements to use this product exclusively at our factory in all our Diesels. In future, therefore, all Cletrac Diesel Tractors will be shipped from the factory with New RPM DELO in their crankcases."

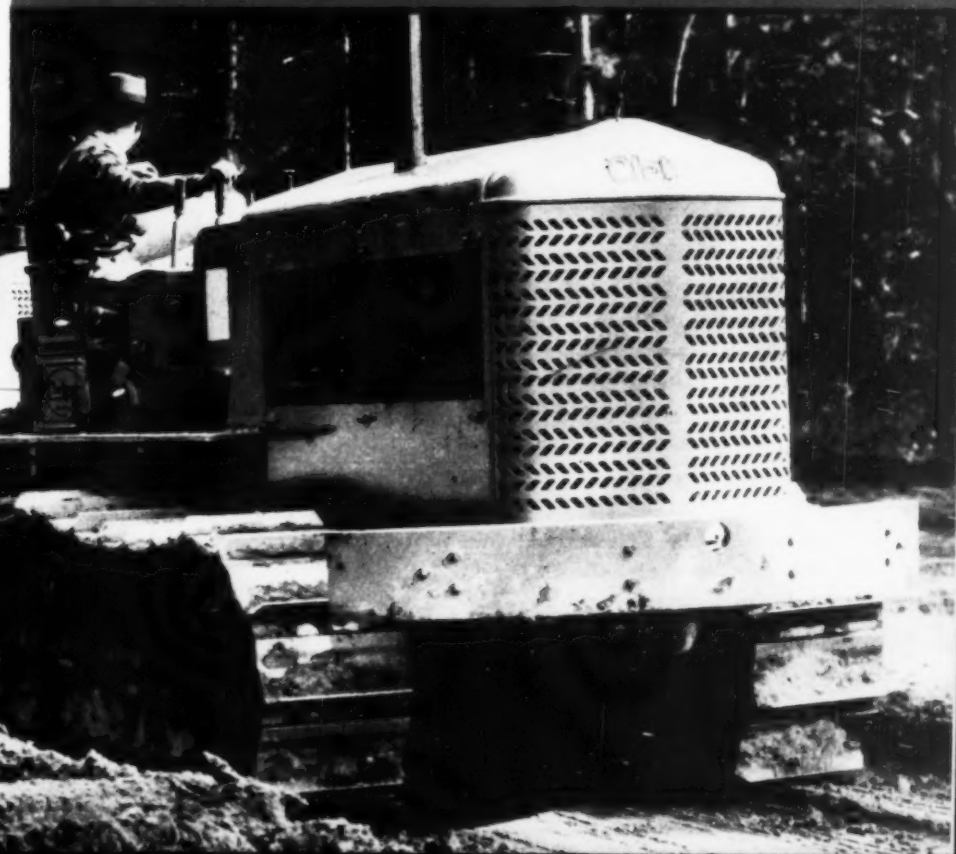
During the critical *break-in*, New RPM DELO brings Cletrac's rings, pistons, liners through to a mirror-smooth finish that lengthens full-power engine life! More—it must prevent ring sticking—and it does. Keep engines free from objectionable carbon—and it does. Guard Cletrac's alloy bearings from corrosion—and it does.

New RPM DELO is lubricating more and more Diesels of every size and type—stationary, automotive, marine. Put it in your equipment to lower operating costs—raise operating profits. *It will!*

**The manufacturers of Hercules and Buda Engines both approve the use of New RPM DELO in all their engines in Cletrac Tractors.*



Model DD Diesel Cletrac and bulldozer building a road near Pittsburgh, Pa.



Model FD Diesel Cletrac and scraper building a new road for the Bureau of Public Roads in Maryland.

STANDARD OIL COMPANY OF CALIFORNIA

USE A LINER THAT FITS YOUR TUNNEL



Small-diameter tunnels, like this 42-inch sewer job, can be lined faster and at lower cost with Armco Light-Duty Plates.

• Why use heavy, bulky liner for small-diameter tunnels when you can save time and money with ARMCO Light-Duty Plates? Their corrugated design provides safe strength free from excessive weight and with less than half the usual depth of plate. Naturally, ARMCO Light-Duty Liner requires less excavation and is easier to install than heavy, bulky types.

Material costs are lower too. You buy only the exact weight of plate needed for the job. In many cases you buy fewer plates because completed rings of ARMCO Tunnel Liner may be spaced to take advantage of self-supporting ground.

Let us show you how you can save real money by using ARMCO Light-Duty Liner Plates on that next small-diameter tunnel. Write for prices and complete information. Armco Drainage Products Association, 5011 Curtis Street, Middletown, Ohio.



ARMCO

LIGHT-DUTY TUNNEL LINER



quired and permits continuous and uniform production of Whiteprints regardless of variation in tracings. Device automatically separates original drawing from print after exposure. Original is returned to operator and exposed print goes to dry developer. Thus, either continuous yardage or cut sheets can be used. — Oxalid Corp., 354 Fourth Ave., New York City.

★ ★ ★

FOUR POINT POSITIVE DRIVE DIESEL TRUCK. 100 hp., 3 to 4 tons, is designed to meet severe operating conditions such as snow removal, dump service and trailer hauling in rough, hilly country. Powered by Cummins 6-cylinder diesel motor developing 100 hp. at moderate engine speed. Features: (1) Four-point positive drive with correct automatic differential and



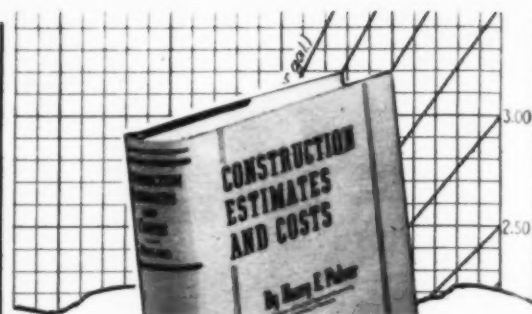
driving action between all four wheels, front and rear, right and left, giving maximum traction for all operating conditions; (2) Fourteen-to-one range transmission with six forward speeds and with single lever control, said to give fast high gear and powerful low gear for emergencies; (3) suspended double



reduction drive with high ground clearance and low unsprung weight; (4) low chassis height and proper weight distribution. Photos show diesel truck with road scraper and diesel snow fighter.—Walters Motor Truck Co., 1001-19 Irving Ave., Ridgewood, L. I., N. Y.

★ ★ ★

NEW TYPE INDUSTRIAL TIRE, for use on hand trucks, trailers, service station grease carts and similar vehicles, is said to have advantages of both pneumatic and solid tires—that is, to combine lightness, high cushioning qualities, streamlined appearance and low cost of pneumatic tire with sturdy construction and load carrying capacity of solid tire.



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CONSTRUCTION ESTIMATES AND COSTS

By H. E. Pulver

Professor of Civil and Structural Engineering,
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653 pages, 6 x 9, many diagrams and tables, \$5.00

- Takes up each element of construction work separately; describes and illustrates simple, arithmetical methods of accurately estimating its cost
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- Covers both estimating with use of tables and of diagrams. Includes many specimens, with diagrams on 113 different elements of construction work conveniently grouped at the back of the book
- Tables and diagrams show variations in quantities as well as in prices of material and labor. Labor tables and diagrams based upon hours of work and hourly wages. Practically all diagrams are straight line diagrams, easy to read and use
- Many worked-out estimates for typical jobs illustrate methods

Chapter Headings

| | |
|--------------------------------|----------------------------------|
| Estimating in General | Lathing and Plastering |
| Handling and Transporting | Heating and Air Conditioning |
| Materials | Plumbing |
| Excavation | Electrical Work |
| Piling and Bracing | Painting, Papering, and Glazing |
| Concrete | Heavy Machinery |
| Masonry | Construction Plant and Equipment |
| Dampproofing and Waterproofing | Overhead and Profit |
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| Roofing and Flashing | Construction Management |

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in TRUCK MIXER DESIGN



Old style, hatch-loading Smith Truck Mixer — predecessor of the SMITH-MOBILE.

New large size SMITH-MOBILE — the "Last Word" in truck mixer design. Note handy feed chute and high discharge without hoist.



Exclusive SMITH-MOBILE FEATURES

HIGH DISCHARGE — permits steeper and longer distributing spout. Discharges into high forms. No hoist or ramp required.

CONTROLLED DISCHARGE — Pour it fast or slow, concrete will not segregate.

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MIXES WHILE CHARGING — Drum rotates during charging operation. Mixing and shrinking of batch start instantly.

VISIBLE MIXING — Sealing door can be opened wide during mixing cycle. You can SEE what's going on.

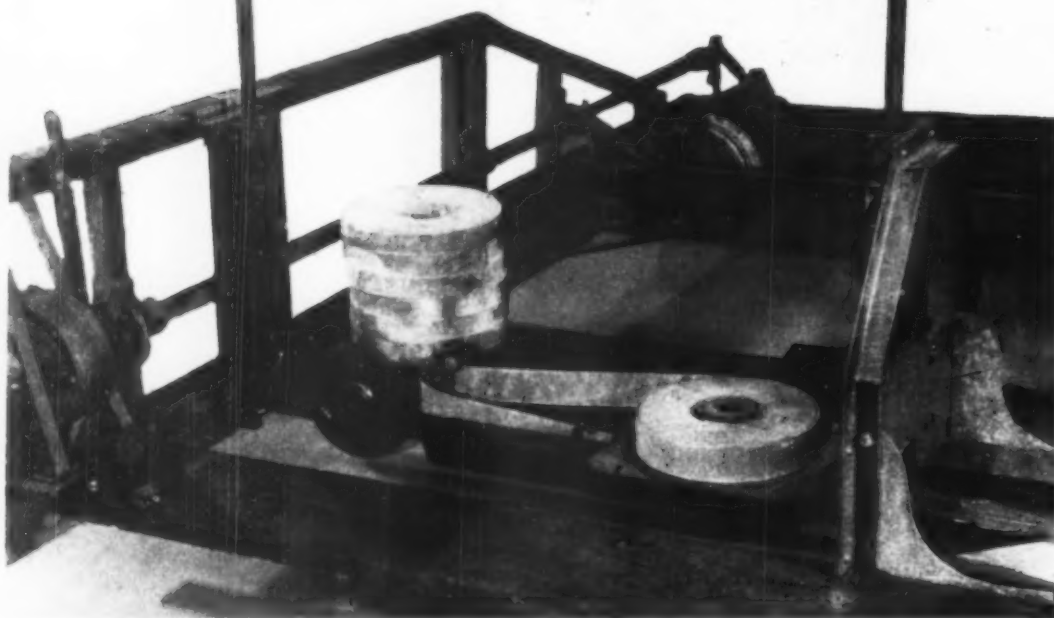
FOR YEARS, truck mixer operators have been trying to get away from leaky and tiresome loading hatches, troublesome rear discharge doors, clogging water bells and inefficient low discharge. Now, the modern SMITH-MOBILE eliminates these disadvantages and includes many exclusive, time-tested features that make for more efficient and convenient operation. Available as truck mixer in five sizes: 1½, 2, 3, 4 and 5 yds.; as agitator, 2½, 3½, 5, 6 and 6¼ yds., respectively. Built and guaranteed by SMITH—concrete mixer manufacturers for more than 40 years. Why not get the complete SMITH-MOBILE story? Write for literature.

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SMITH-MOBILE

THE *Modern* TRUCK MIXER and AGITATOR

"CONTRACTION JOINTS IN ROADS"



They have behaved well—especially the ribbon type, which has now replaced most all others. They are neat, tight fitting and usually last as long as the road without maintenance.

FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO

"IT DIGS AND FILLS
BETTER IN SHALE
AND ROCK THAN
ANY BUCKET
I HAVE EVER USED"



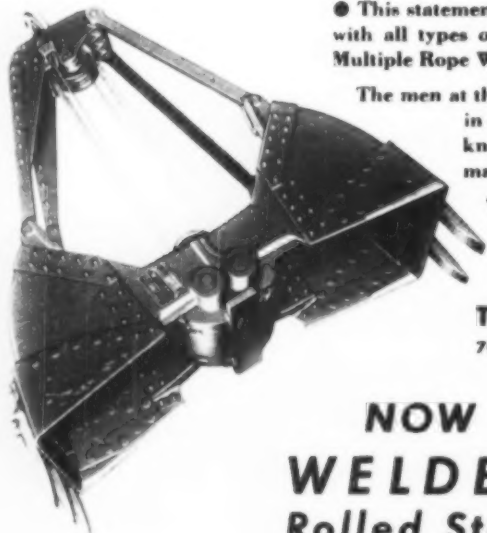
● This statement came from a crane operator who for 25 years has worked with all types of buckets. The bucket which won his praise is a 3/4 yard Multiple Rope Williams Bucket used by F. F. Mengel Co., Wisconsin Rapids.

The men at the controls know how Williams Buckets can help make time in digging and moving yardage. The men in the "front office" know how Williams Buckets stack up in long service and low maintenance cost.

They're "Built to Last and Move Dirt Fast"

Bulletins describing all types of
Williams Buckets sent free on request

THE WELLMAN ENGINEERING COMPANY
7017 Central Avenue Cleveland, Ohio



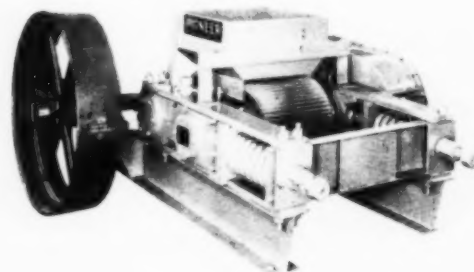
**NOW
WELDED
Rolled Steel
Construction**

WILLIAMS
Buckets
built by **WELLMAN**

Now available in two sizes — 6x2.00 and 8x2.50. New design claimed to eliminate hazard of tire failure because of punctures or leaky valves and to require no servicing such as inflation or tire repairs, this feature being of particular advantage to operators of large numbers of vehicles where freedom from delay is important. New tire interchangeable on same wheel with single-tube pneumatic tires of like sizes. — **B. F. Goodrich Co., Akron, Ohio.**

★ ★ ★

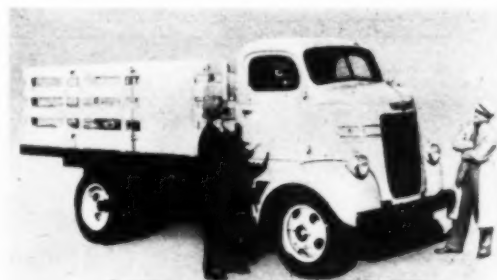
ROLL CRUSHER with 16-in.-diameter rolls and 16-in. faces is offered with either bronze or Timken bearings, completing Pioneer line of crushers with 16- to 54-in. diameter models. Bearings in bronze bear-



ing crusher are inclosed and protected from dust, same as anti-friction bearings. Crusher is equipped with fine, corrugated rolls which will produce small materials, yet have large "bite." Manganese steel shells are replaceable. Crusher is gear driven and all gears are located on one side of crusher and fully inclosed. — **Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn.**

★ ★ ★

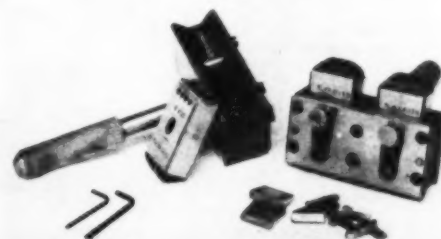
CAB-OVER-ENGINE TRUCKS, 1 1/2-ton models, are available in three wheelbase lengths, 105, 129 and 159 in. Powered by 6-cylinder L-head truck engines which develop 92 hp. at 3,000 r.p.m. VM series has full-floating rear axles with hypoid gears and VMA



model trucks are equipped with two speed full floating rear axles with planetary reduction gears between bevel and differential. Additional feature: large, well ventilated, insulated cab providing ample foot room and safety vision for driver. Maximum gross rating, 13,500 lb. — **Dodge Division, Chrysler Corp., Detroit, Mich.**

★ ★ ★

MARKING DEVICE FOR ROUND SHAFTS, designed for use either of solid or low cost individual type, consists of type retainer and guide holder, V-shaped bottom of which is so proportioned that sides rest against round shaft, providing support on both sides.



aligning type and insuring clear marking on center. Type retainer floats in guide, but its travel is limited by pin extending into elongated hole in type retainer. Individual type retained by set of screws. To remove type retainer, pins are retracted against spring pressure by knurled knobs shown in photo. Hardened and ground anvil is provided in type retainer to prevent type from sinking. — **New Method Steel Stamps, Inc., 143 Jos. Campau St., Detroit, Mich.**

"HERCULES" (Red-Strand) WIRE ROPE

REG. U.S. PAT. OFF.



MADE OF

Acid Open Hearth
STEEL WIRE



All Leschen Steel Wire Ropes are made of acid open-hearth steel wire, because such wire has specific and decided advantages in producing wire rope that is more uniform . . . more dependable . . . longer lasting.

Acid open-hearth steel is more uniform in its chemical analysis, freer from slag and impurities, and has a higher elastic limit for the same carbon content than basic open-hearth steel. Most important to the wire rope user, however, is the fact that wire rope made from acid open-hearth steel wire has higher fatigue resisting qualities, which means longer life in actual service.

And our policy of leaving nothing to chance in the manufacture of "HERCULES" (Red-Strand) Wire Rope, not only makes it long lasting, but safe and economical as well.

For maximum efficiency in Preformed Wire Rope, use Preformed "HERCULES". It is available in both Round Strand and Flattened Strand constructions.

A. LESCHEN & SONS ROPE CO.

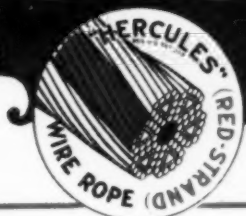
WIRE ROPE MAKERS

5909 KENNERLY AVENUE

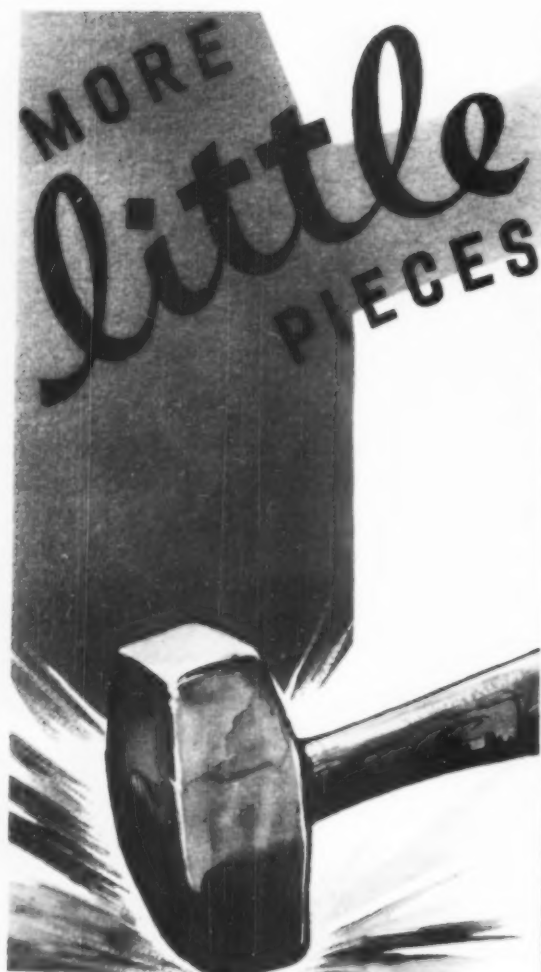
ESTABLISHED 1857

ST. LOUIS, MISSOURI, U. S. A.

NEW YORK / / / 90 West Street
CHICAGO / / 810 W. Washington Blvd.
DENVER / / 1554 Wazee Street



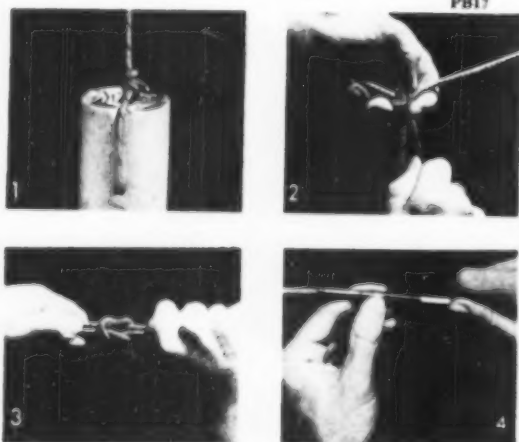
SAN FRANCISCO / / 520 Fourth Street
PORTLAND / / 914 N. W. 14th Avenue
SEATTLE / / 3410 First Avenue South



Little pieces are a big factor in economical removal of material after blasting. Such economy is assured by using Primacord-Bickford Detonating Fuse in the holes and in connecting all holes. More power is developed from explosives, because every cartridge is exploded *directly* by this powerful fuse. Fractional time delay between holes and rows of holes also permits correct relief of burden. This results in excellent fragmentation, elimination of secondary blasts, easier removal of material and less moving of equipment.

The ENSIGN-BICKFORD CO., Simsbury, Conn.
Makers of Cordeau-Bickford Detonating Fuse
— and Safety Fuse since 1836.

PRIMACORD-BICKFORD Detonating FUSE



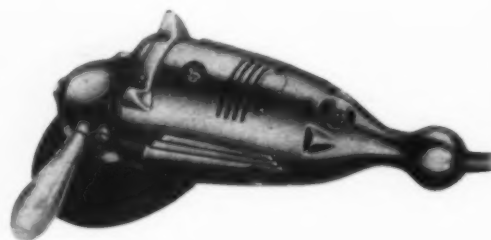
1. Tie through cartridge.

2. Half hitch branch to main line.

3. Connect main line lengths with square knot.

4. Fuse and cap on end of main line.

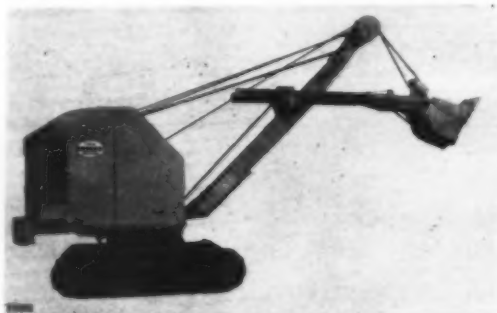
STREAMLINED HEAVY-DUTY SANDER. 7-in., high-speed, for general production and maintenance, is said to be amply powered for metal finishing, removing scale and rust with wire brush and for smoothing welds and casting ridges with cup grinding wheel. Straight-line ventilation claimed to prevent clogging and to assure cool motor operation.



Air outlet diverts dust-laden air from operator. Flexible rubber pad adapts sander to curved or flat surfaces. Thumb-operated switch; ball-type rear handle. Reversible side handle may be moved to front or side of tool to suit operator. Sander equipped with ball bearings with heat-treated gears in grease tight case. Spindle lock for disks. Powered by universal a.c. or d.c. motor, 25 to 50 cycles, 110 v., but available for other voltages. Equipment: 7-in.-diameter 3-in-1 flexible rubber pad, three abrasive disks, spanner wrench, three-wire rubber cable, wire for grounding and indestructible rubber attachment plug. — U. S. Electrical Tool Co., Cincinnati, Ohio.

★ ★ ★

IMPROVED TYPE EXCAVATOR $\frac{3}{4}$ - and $\frac{1}{2}$ -yd. models have following new and improved features: (1) Independent chain crowd to give greater crowding pressure and fast retraction; (2) internal expanding clutches to minimize internal friction and deliver all engine's power to pull of rope; (3) larger clutches on hoist and digging drums to provide $42\frac{1}{2}$ per cent greater friction area and 65 per cent increased effi-



ciency; larger clutches on swingers said to have 20 per cent greater friction area and 30 per cent increased efficiency; (4) larger brakes with high ratio brake operating mechanism on hoist and digging drums to provide $12\frac{1}{2}$ per cent greater friction area; (5) improved pressure lubrication system and fully inclosed horizontal gears running in oil; (6) mechanically controlled cab temperature; (7) operation of attachments improved by reversible two-speed drum; (8) new type chain crowd skimmer attachment. — Inaley Manufacturing Corp., Indianapolis, Ind.

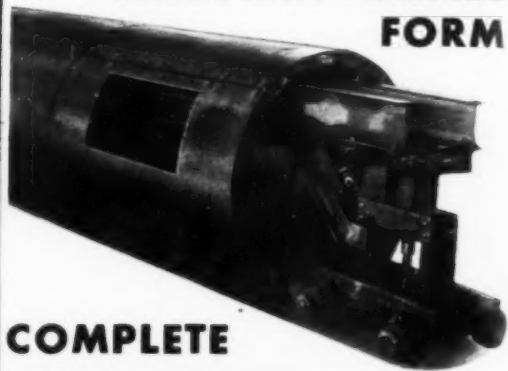
★ ★ ★

RENEWABLE POINTS FOR SCARIFIER TEETH made of special alloy steel are now available for Caterpillar auto patrols and blade graders. They are made of special alloy steel, fit all scarifier blocks



and take place of one-piece teeth. Points only need to be renewed, and these are said to last three to seven times longer than one sharpening of ordinary teeth. Hammer is only tool needed to put on or remove points. — Caterpillar Tractor Co., Peoria, Ill.

UNION "HIGH PRESSURE" • CIRCULAR TUNNEL FORM



COMPLETE CIRCLE FORM FOR FAST WORK!

Here's a UNION product that shows what we can design and build to speed up a job! This form, 50' long, is traveler-mounted for fast erection, stripping and forward movement. The front truck rides on 30" gauge track, the rear on rubber wheels, riding on previously poured concrete.

Have YOU got a tunnel job? Is it big? Is it small? Is it circular, or horseshoe? Whatever it is, trust UNION forms to speed it up, cut down costs! Write for Bulletin on Steel Form design.

UNION IRON WORKS, INC.

Engineers and Manufacturers

SPOFFORD & LIDGERWOOD AVES.
ELIZABETH, N. J.

SIMPLE
RUGGED
DEPENDABLE

CONSTRUCTION
EQUIPMENT

**STERLING
PUMPS
•
SAW
RIGS**

**STERLING
HOISTS
•
GENERATING
PLANTS**

**THANK YOU for visiting
our booth at the Road Show**

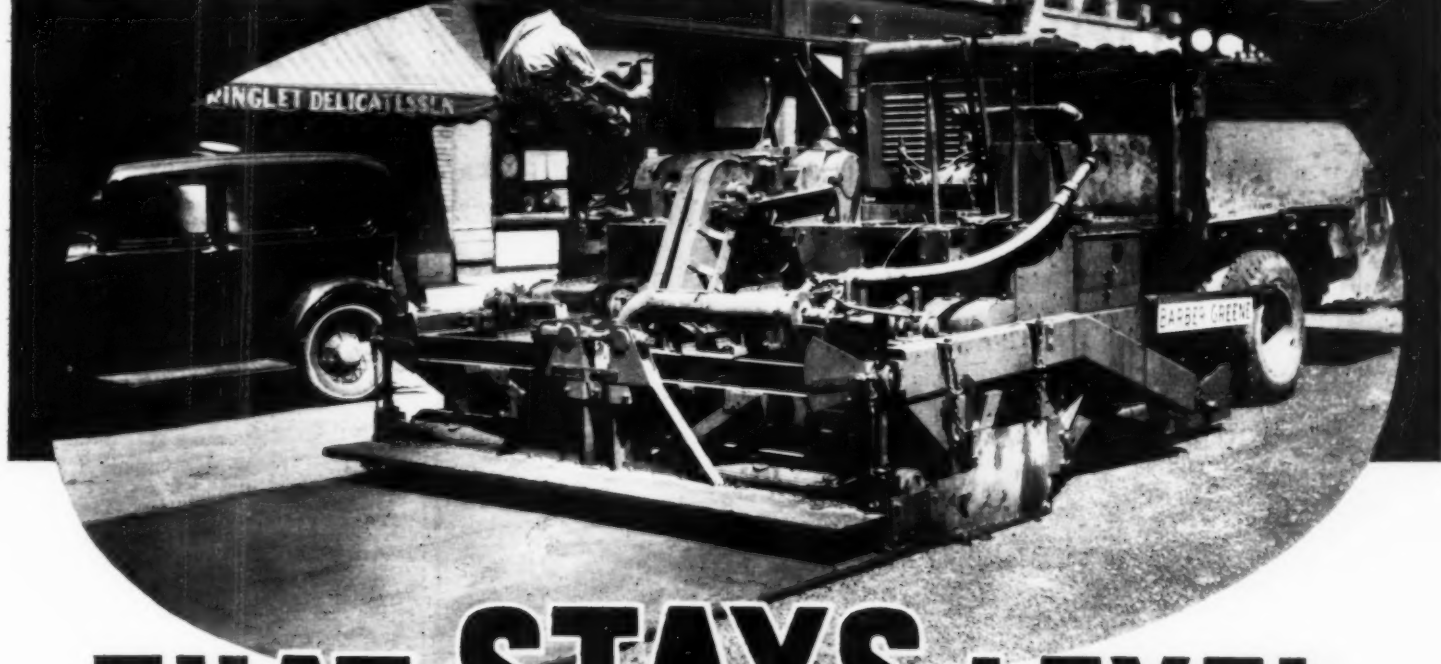
Sterling Construction Equipment — with
newest improvements and latest develop-
ments in engineering and design — will
mean *increased production and larger
profits to you* — during the year.

RECOMMENDED BY
LEADING CONTRACTORS
AND
ENGINEERS EVERYWHERE

Sterling

MACHINE CORPORATION
411-13 Southwest Blvd. Kansas City, MO

LEVELING



THAT STAYS LEVEL

THE common goal in all road building is a permanently smooth riding surface. Bituminous finishing methods have gradually improved, but even with expensive forms for leveling, the surface would not stay level under rolling and traffic. There was more compaction over the low spots, or in the thicker portions; and variations in compaction due to uneven fluffing. The Barber-Greene Finisher was developed to overcome this problem. Hundreds of miles of level road throughout the country testify to its complete success.

Its ingenious leveling principle has established a new standard of excellence in bituminous road construction. But the perfection of its leveling principle would be worthless without the exclusive Barber-Greene Tamping—which makes the road *Stay Level*. The Barber-Greene Levels and Tamps simultaneously. It *Compacts* the material down to the correct level. It *Automatically* compresses more material into the depressions. The Barber-Greene and only the Barber-Greene has this ingenious leveling principle coupled with Tamping.

The new 36 page Barber-Greene Finisher Booklet clearly explains and illustrates the Leveling and Tamping Principles. Also, the Full Crawler Traction, the 5 Ton Receiving Hopper, the Dual Controls, and the Versatility of this Barber-Greene. Phone, write, or wire for your copy. There is no obligation.

Barber-Greene Company,
Aurora, Illinois.



• STANDARDIZED MATERIAL HANDLING MACHINES •

Representatives
in Principal Cities

BARBER GREENE

BRANCH OFFICES
Cleveland • Chicago • New York
Columbus • Boston • Detroit
San Francisco • BARBER-GREENE

Standardized Belt Conveyors

CARRIERS
Permanent CONVEYORS
and other standardized unit parts

LOADERS
for lowest cost loading

Vertical Boom DITCHERS

MIXERS
for Bituminous or Stabilized Mixing
Central or Travel Plant

SNOW LOADERS
for high speed removal

Leveling-Tamping FINISHERS

Low Cost-High Quality Road Construction

CUT THE COST OF READY MIXED CONCRETE



BUY THE TRUCK MIXER WITH THESE REXCLUSIVE FEATURES

- 1 Rex Man-ten Cone-End Mixing Drum—gives 100% thorough mix without need of "throw-back" blades. Positive, end-to-end mixing action.
- 2 Rex Positive Shock Absorbing Flexible Chain Drive—better than 98% efficient! Far lighter, far more shock absorbent than any gear-type drive in the business!
- 3 Rex Full-Floating Rear Drum Mounting: non-flanged, Timken Equipped Drum Rollers eliminate destructive end play!
- 4 Rex Front Drum Mounting—a Rex double row self-aligning ball bearing, absorbs end thrust and kills end play before it has a chance to start!
- 5 Rex Automatic Overflow Water Tank—with new Rex Nozzle Closers. 100% foolproof, discharging into center of drum through one nozzle!

Ask About the Rex Time Payment Plan

Now you can buy Rex Moto-Mixers and pay for them as the money comes in! Send today for complete details about the Rex time payment plan. Ask for catalog, too! Address the Chain Belt Company, Dept. MM-2, 1664 W. Bruce Street, Milwaukee, Wisconsin.

**BUY
REX-MOTO MIXERS
AND BE RIGHT!**

NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use

PORTABLE ELECTRIC TOOLS — Black & Decker Mfg. Co., Towson, Md. (61 pp., illustrated.) Covers complete line of company's portable electric tools, including drills, saws, hammers, grinders, nut runners, screw drivers, sanders, surlacers, etc. Among new units are the 1/4- and 1/2-in. Junior drills, the latter equipped with a universal motor that is claimed to increase power by 20 per cent and torque by 40 per cent. New compact gear-train reduces length of tool and "nose heaviness." Removable commutator covers make brush inspection easy. Specifications and prices for each model of tool.



PORTABLE POWER PIPE THREADING MACHINE—Beaver Pipe Tools, 370 Dana Ave., Warren, Ohio. (4 pp., illustrated.) Describes new Model B 1/2- to 2-in. pipe and bolt machine which has pipe cutting, threading and reaming tools mounted on carriage operated by rack-and-pinion feed. No hand tools needed. Model available with gear-driven oil pump; with 1-gal. overhead reservoir which feeds oil by gravity; or it may be used with hand oiler.

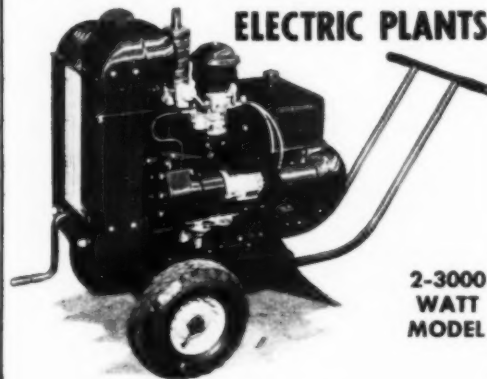
ALL-WHEEL DRIVE TRUCKS AND TRUCK-TRACTORS—Marmon-Herrington Co., Inc., Indianapolis, Ind. (16 pp., illustrated.) Describes and illustrates complete line of Ford medium and lightweight trucks, truck-trailers, passenger and commercial cars converted to all-wheel drive to meet requirements for tractive ability, economical operation, safety and speed rather than for size and unusual power. Groups interested in this type of vehicle are: oil scouts and seismograph crews; loggers and conservation crews; snow fighters; road builders; fire-fighters. Converted vehicles said to be capable of withstanding an amazing amount of hard service in deep mud, sand, earth, snow and over rocky mountain trails. Lessened stress and strain on motor and chassis, due to distribution of power and traction to four or six wheels instead of two, said to contribute greatly to long life of all-wheel-drive machines. Six wheel drive available, if desired.

TRUCK AND TRAILER SIZE AND WEIGHT RESTRICTIONS FOR 1940—The Four Wheel Drive Auto Co., Clintonville, Wis. (56-p. booklet.) Interpretation of restrictions on size and weights of trucks and trailers as imposed by each state through action of legislatures. Extreme diligence was exercised to eliminate errors in this compilation of laws and regulations limiting size and weight of trucks and trailers by obtaining cooperation of responsible officials in each state who in most cases have checked and approved the laws as passed. In several states, actual text of new legislation was not available and is subject to correction and verification.

TRUCK SHOVEL CRANES—Bay City Shovels, Inc., Bay City, Mich. (8 pp., illustrated.) Describes and illustrates Bay City Model 18 truck shovel-crane of 3/4-cu.yd. capacity with 16 1/2-ton crane rating. Reviews important details of machinery assembly featuring unit-cast alloy steel revolving table, tandem drums, helical gears, chain crowd and mounting of cast roller path on built-up structural truck frame. Complete specifications and working ranges for shovel and crane operation.



ONAN Portable ELECTRIC PLANTS



2-3000
WATT
MODEL

Contractors! Here is THE source of ELECTRIC POWER you have been looking for — Increase Profits on Your Jobs

ONAN ELECTRIC PLANTS are HEAVY DUTY, COMPACT, DEPENDABLE — READY TO TACKLE THE TOUGHEST JOBS. SPEED UP THOSE JOBS—INCREASE YOUR PROFITS—BE IN A POSITION TO BID ON MORE AND BIGGER CONTRACTS THIS YEAR.

ONAN ELECTRIC PLANTS furnish sufficient Power for Operation of all PORTABLE ELECTRIC TOOLS used on the Job — Drills, Saws, Grinders, Tampers, Sanders, Water Pumps, Many Others, and in addition will furnish Plenty of Light for those Night Jobs.

The many sizes from 350 to 50,000 Watts, enables you to choose the Plant best suited to your needs. There are Models equipped with pneumatic rubber-tired Dollies, as shown above, also types equipped with carrying Handles and Light enough for One Man to carry about with ease.

ONAN PLANTS, in Stationary and Portable Models, are used in every conceivable type of service IN ALL PARTS OF THE WORLD, and are giving DAILY UNINTERRUPTED SERVICE.

SHIPPED COMPLETE—READY TO RUN

Drop us a card or letter and let us send you Literature describing the Complete Line.

D. W. ONAN & SONS

716 ROYALSTON AVENUE • MINNEAPOLIS, MINN.

NEW DRILL-POINT SAVES HOURS OF DRILLING TIME

Amazing new drill-point contains special metal harder than hardest steel. Goes through concrete, tile, slate, porcelain, etc., 50 to 75% faster. Drills cleaner, more accurate holes. Speeds up installation of expansion anchors. Saves your skilled time for more profitable work. Eliminates noisy hammering, monotonous chiseling. Doesn't splinter fragile work. No special equipment needed—use in any rotary drill. Get your share of those extra profits now possible. Send coupon for leaflet.

CARBOLOY COMPANY, INC.
DETROIT, MICHIGAN

Send for
FREE
FOLDER

DRILL CONCRETE,
TILE, BRICK, ETC.

**50%
FASTER**

Carboloy Co., Inc.
11125 E. 8 Mile St., Detroit

Send free leaflet on Carboloy Masonry Drill-Points, for drilling concrete 75% faster.

Name _____

Company _____

Street _____

City _____ State _____

**CARBOLOY
MASONRY DRILL-POINTS**

WOOD PRESERVATION—**American Lumber & Treating Co.**, 37 W. Van Buren St., Chicago, Ill. (16 pp., illustrated.) Describing and illustrating representative installations of wood which has been "Wolmanized," that is, impregnated by vacuum-pressure full cell process with solution of Wolman salts, said to extend life service of wood by eliminating failure due to decay or insect attack. Installations shown include: Buildings used in wet process industries; docks, piers, boardwalks; railroad structures; bridges; posts and poles; oil production structures; mine timbers; refrigeration; institutions and municipal buildings; sanitary works and water supply; stadiums; miscellaneous, such as boats and barges; Hollywood sound stages; poster panels; fences; tennis courts and retaining walls.



★ ★ ★

SHIELDED-ARC ELECTRODES — **The McKay Co.**, York, Pa. (24-p. booklet, illustrated.) Contains tentative specifications for iron and steel arc-welding electrodes approved both by the American Welding Society and the American Society for Testing Materials. Also charts and tables showing proper use of various mild-steel electrodes, according to nature and conditions of work.

★ ★ ★

PORTABLE POWER PLANTS — **Electric Taper & Equipment Co.**, Ludington, Mich. (8 pp., illustrated.) Contains descriptions and photographs of four power plants for use on railway and construction operations. Produce both single and 3-phase, 110-v. alternating current. They generate 3-phase current but are furnished with single-phase adaptor which supplies this kind of power when desired, simply by plugging into generator outlet. Four models available: V-1 of 3/4 kva. capacity, H-15 and WS-4 of 2-kva. capacity, and BH-4 of 5-kva. capacity. Rated capacity of D-type cells is as follows: D6, 450 amp. hr.; D8, 600 amp. hr.; D10, 750 amp. hr.; D12, 900 amp. hr.

★ ★ ★

POWER GRADER—**Austin-Western Road Machinery Co.**, Aurora, Ill. (24 pp., illustrated.) New "99" unit with 13-ft. blade drives and steers on all four wheels. Has pneumatic tires, leaning front wheels, long front axle, hydraulic power adjustments, precision side shift and stabilized blade. Gas or diesel power. Weight 15,025—16,100 lb.; overall length 22 1/2 ft. Adapted to wide range of operations, including rough grading, terracing and drainage, heavy ditching, mixed-in-place work, maintenance, snow removal, scarifying. Specialized attachments include: belt loader, sloper, finisher, roller, disk broom, bulldozer, snow plow and scarifier.

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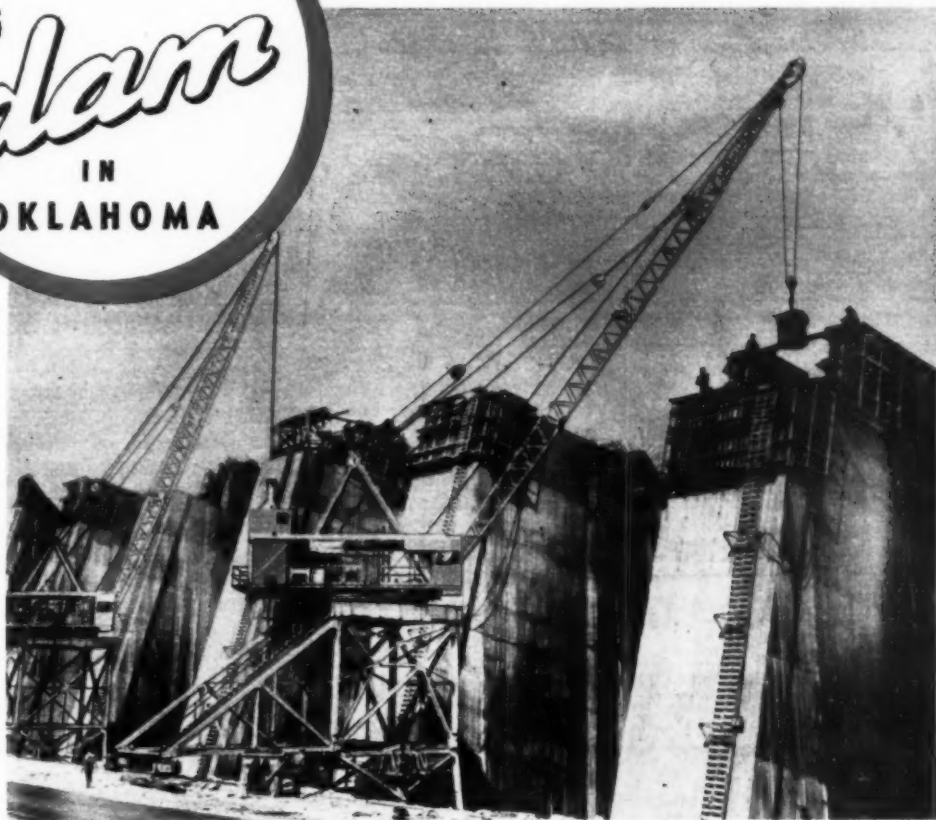
ARC-WELDING ELECTRODES — **General Electric Co.**, Schenectady, N. Y. (40-p. illustrated bulletin.) Prepared as guide for proper selection of electrodes.



Gives important suggestions on welding technique with different types of electrodes and presents some factors influencing their choice. Complete descriptions of twenty types of General Electric electrodes, their applications, sizes, recommended currents, arc voltages and identification. Lists characteristics of deposited weld metal, give charts of joint forms and positions and provides handy estimator for electrode quantities.

★ ★ ★

WRINKLE BENDING PIPE—**The Linde Air Products Co.**, 30 E. 42nd St., New York City. (4 pp., illustrated.) Leaflet describes recently perfected wrinkle-bending method for bending pipe, especially useful in installation of cross-country pipe lines or wherever else pipe has to be "tailored" to fit. Depends upon use of oxyacetylene flame for heating narrow band about half way around pipe at point at which change of direction is desired. When this band has reached red heat, pipe is bent mechanically with heated portion at inside of bend. This causes slight upsetting of heated metal and produces change of direction from 4 to 6 deg. When greater changes of direction are required, series of wrinkle bends result in smooth, long sweep bend of any desired angle. Upset metal projects outwards from inside of bend so as not to interfere with flow of fluid through pipe and without restricting diameter of bend.



Battery of AMERICAN REVOLVERS Speed up Big Grand River Dam Job For Massman Construction Co.

AMERICAN REVOLVERS with 100-foot booms and mounted on 50-foot special traveling gantries are making a wonderful record on the Grand River Dam near Vinita, Oklahoma. On light loads the AMERICAN REVOLVERS are being run about three times as fast as they are supposed to and the vibration is so great that no glass will stay in the cab windows. However, the machines are standing the pressure magnificently and are the pride and joy of every man on the job.

If you have a material handling problem let us tell you about the AMERICAN REVOLVER.

AMERICAN HOIST & DERRICK CO.

NEW YORK

SAINT PAUL, MINNESOTA

CHICAGO

AMERICAN TERRY DERRICK CO.

SOUTH KEARNY, N. J.



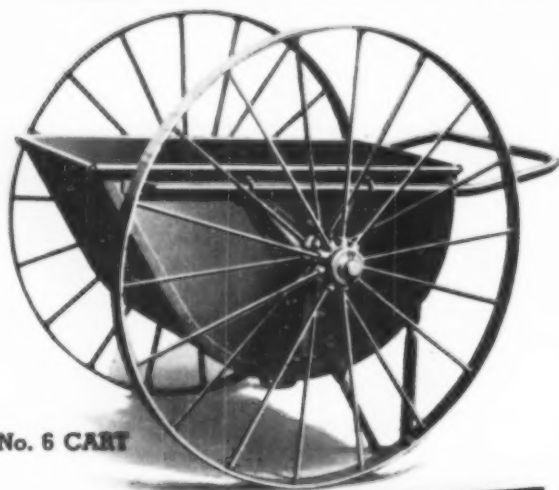
DEALERS WITH STOCK IN ALL PRINCIPAL CITIES

the Genuine **CROSBY** wire rope **CLIP**

PERFECT GRIP DROP FORGED
STEEL NOT GALVANIZED



THE CART THAT CAN TAKE IT



No. 6 CART

STERLING
WHEELBARROW CO.
7100 W. WALKER ST.
MILWAUKEE, WIS.

FOR HEAVY DUTY

12 gauge tray all welded.
1/2" dia. continuous butt-welded rod at top of tray.

Malleable brackets extending full depth of tray.

42" diameter wheels—flat or oval tire.

Plain or roller bearings.

Can be equipped with 44" diameter pneumatic tire wheels.

Other carts having 30" or 36" diameter steel wheels, and 30" diameter pneumatic tire wheels.

SPRAY PAINTING AND FINISHING EQUIPMENT—**Binks Manufacturing Co.**, 3114-40 Carroll Ave., Chicago, Ill. (104 pp., illustrated.) Catalog organized for ready reference. Gives answers to everyday finishing problems, reports new developments in spray painting equipment, quotes prices and provides engineering and performance data on all types of spray guns, spray booths, air compressors, painting outfits, extractors, respirators and hose.

★ ★ ★

DIESEL ENGINES—**Hercules Motors Corp.**, Canton, Ohio. (16 pp., illustrated.) Concise yet comprehensive explanation of modern high-speed, heavy-duty diesel engines is covered in question and answer form. Comparisons are presented between diesel engines and gasoline engines; also between the two-cycle and four-cycle types of diesel engines. The complete line of Hercules two-cylinder, four-cylinder and six-cylinder engines is shown, including the Hercules complete "power package" replacement diesel for Ford trucks for the years 1935 to 1940, inclusive.

★ ★ ★

DISCUSSION OF *Labor Agreement*

(Continued from page 39)

and bounds, and it will, if it keeps the right leadership and builds for the future rather than a present or temporary advantage. If labor unions allow themselves to become enmeshed in politics, or in various forms of racketeering, it will only be a question of time until the public will rise up and demand that they be muzzled. The unions have a wonderful opportunity and it is hoped that they will respond.

Reverting to the Western Pennsylvania agreement, it will be noted that in addition to providing for the arbitration of disputes, we propose forming a Board of Research for the purpose of observing the economic trends in the territory covered by the agreement. This idea may sound somewhat idealistic, but it is something to which careful attention should be given. Not only should we have a Board of Research for Western Pennsylvania, but for the entire United States as well.

The true measure of the wage of the workman is what his wage will buy. The rates of pay should go up or down with the trend of economic conditions, but it should not hit the ceiling or go down into the cellar, as has been the past experience. A reasonable deflation of wages during depression is beneficial, as it helps to revive business. Too much of anything, however, is harmful. It is our hope that our Heavy Construction Agreement will prevent the recurrence of the cut-throat bidding that has resulted each time there was a dip in the volume of available work.

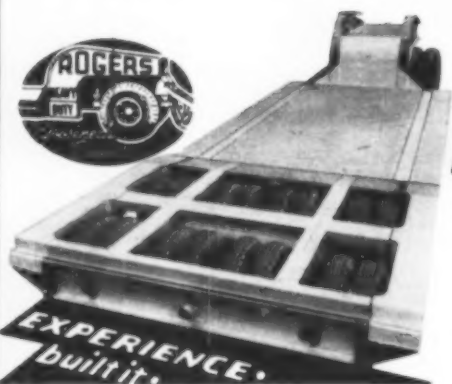
All these things could be accomplished if we were all honest with ourselves and each other. We have every hope that what we have done in Western Pennsylvania is a step in advance and will result in a betterment of conditions both for the contractor and his employees. Furthermore, the interests of the employer and the employee are identical, and the sooner we all realize it the better.

Haul 10 ft.

LOADS and

Return Quickly

with 8 ft. TRAILER



ROGERS swinging side brackets permit you to haul the occasional extra wide load on a trailer that

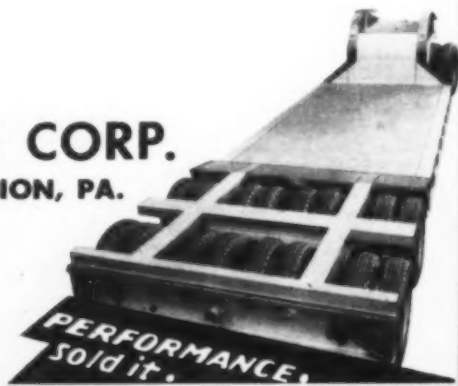
normally complies with legal limits as to width. Trailers with capacities as large as 60 tons are available so equipped.

ROGERS BROTHERS CORP.

220 ORCHARD STREET

ALBION, PA.

**ROGERS
TRAILERS**





**SAVE
3 WAYS
WITH LUBRIPLATE**

**Lubricate your plant with Lubriplate
— the New Principle Lubricant!**

Are your lubricant bills running too high? Are replacements due to faulty lubrication excessive? Are you worried about noisy gears, hot running bearings or oil-dripping chains?

Then Lubriplate is your answer. Try Lubriplate on the *toughest* lubricating job in the plant. See for yourself how this *new principle* lubricant stops noise—ends dripping—cools running temperatures—slashes lubricant consumption—reduces labor charges to a minimum.

7 QUICK FACTS

1. Lubriplate produces a wear-resisting bearing surface.
2. Lubriplate resists rust corrosion and pitting.
3. Lubriplate reduces friction, thus lowering maintenance costs and power costs.
4. Lubriplate is white and clean.
5. Lubriplate outlasts ordinary lubricants many times.
6. Lubriplate is economical—a little goes a long ways.
7. Lubriplate is available in fluid and grease types for every need.



**1 SAVE
WORK**

**2 SAVE
WORRY**

**3 SAVE
MONEY**

**TRY
LUBRIPLATE
TODAY**

A large aluminum company* was forced to lubricate coilers, shears and presses from 2 to 3 times each shift. With Lubriplate, a *single lubrication* per shift was all that was needed. In addition, 1 pound of Lubriplate goes as far as 3 pounds of the former lubricant.

A leading food packer* was faced with a mean lubricating problem. Oil was dripping badly from a single long conveyor which wove all about the shipping floor. The conveyor squeaked constantly. The day Lubriplate was introduced, squeaks and dripping stopped—*completely*. What's more, the Superintendent reports that "Lubriplate lasts a surprisingly long time. Now we are using Lubriplate on many applications."

Prior to using Lubriplate, a leading vulcanized fibre company* found that *one* gear consumed 36 gallons of oil, required 4 gear replacements and \$6 replacement labor over a six months' period—for a total cost of \$79.82. During the next 6 months Lubriplate was used at a total cost of \$2.50. No replacements. No labor charges.

*NAMES ON REQUEST

Lubriplate Division of
FISKE BROTHERS REFINING CO.
NEWARK, NEW JERSEY • TOLEDO, OHIO
Dealers from Coast to Coast

LUBRIPLATE

THE WHITE LUBRICANT THAT MINIMIZES WEAR

The New

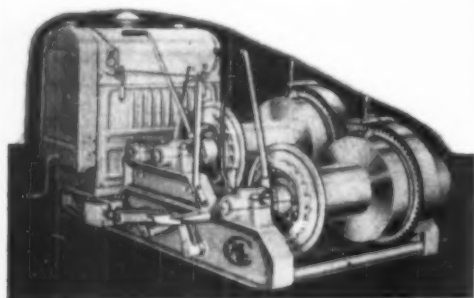
AS ALWAYS, MORE OF EVERY-
THING FOR YOUR MONEY!

- ★ MORE IMPROVEMENTS
- ★ MORE FEATURES
- ★ MORE DEPENDABILITY
- ★ MORE PROFITS TO YOU

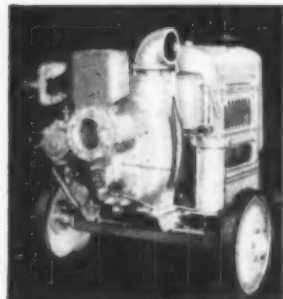
C.M.C. Line



CMC Portable Bin Batcher. A great labor saver. Used with CMC 105 or 145 Mixer. Boosts output . . . gets work done quicker.



CMC Hoists up to 40 H.P. Single or double drum, non-reversible. Also several reversible models.



CMC Pumps. New triple prime well point pre-drainage pump illustrated. Made in 4", 6", 8" and 10" size. Others from 2" up.

CMC'S GREAT NEW CATALOG READY!

Shows latest in Concrete, Plaster and Mortar and Bituminous Mixers, Pumps, Hoists, Saw Rigs and Carts. A graphic display of the latest in equipment.

WRITE TODAY!

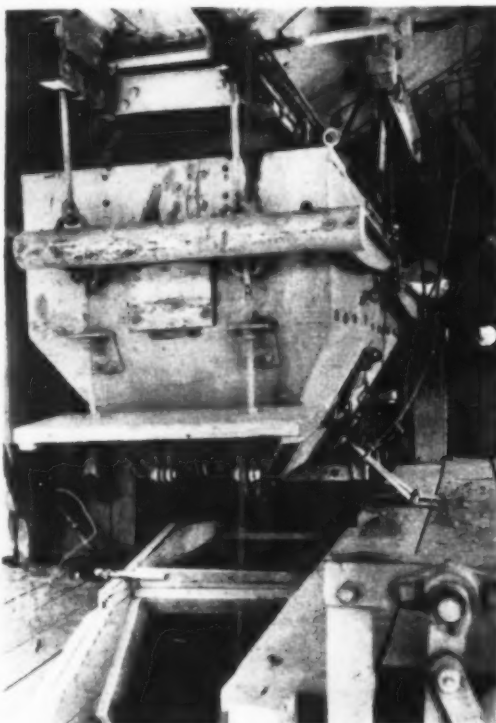
CONSTRUCTION MACHINERY CO.
WATERLOO, IOWA

Central Plant PUMPS CONCRETE TO FOUR BUILDINGS

(Continued from page 42)

gravel for both mixers, a hand-operated baffle in the charging hopper directing each batch to the proper mixer. Sack cement was stored in an elevated house on a level with the batching platform.

Induction motors drove the hoist and the two mixers of the concrete plant. Incoming power for these motors was stepped down to 220 v. by transformers on a pole alongside the plant. A Clyde double-drum hoist operating the two tower buckets was gear-driven by an Ideal 40-hp. motor equipped with Union speed control. The two mixers were a Smith 28S and a



HAND-THROWN FLAP GATE in hopper under weight batchers directs charge to either of two mixers. Sack cement is handled out of storehouse in background.

Koehring 21S. A G. E. 20-hp. motor turned the 28-cu.ft. mixer, the power being transmitted by multi-V-belt drive. The smaller mixer was gear-driven by a G. E. 40-amp., 220-v. motor.

Concrete Delivery—Both mixers discharged into a Rex double-chambered concrete pump delivering through a Y connection into a 7-in. pipe line made up of 10-ft. sections with quick-acting toggle couplings. Where possible in construction of walls and first floor slabs, the pipe line delivered to spouts or chutes placing concrete directly in the forms. For roof slabs and for the second floor slab on the one produce building, concrete was discharged into a double-gate floor hopper from which it was drawn off into 9-cu.ft. carts equipped with pneumatic tires. The contractor

(Continued on page 86)



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T. R. Agg's **ROADS AND PAVEMENTS** needs no introduction to experienced highway engineers. Since the first edition was published in 1916, the book has been recognized and accepted here and abroad as the classic reference work in the field.

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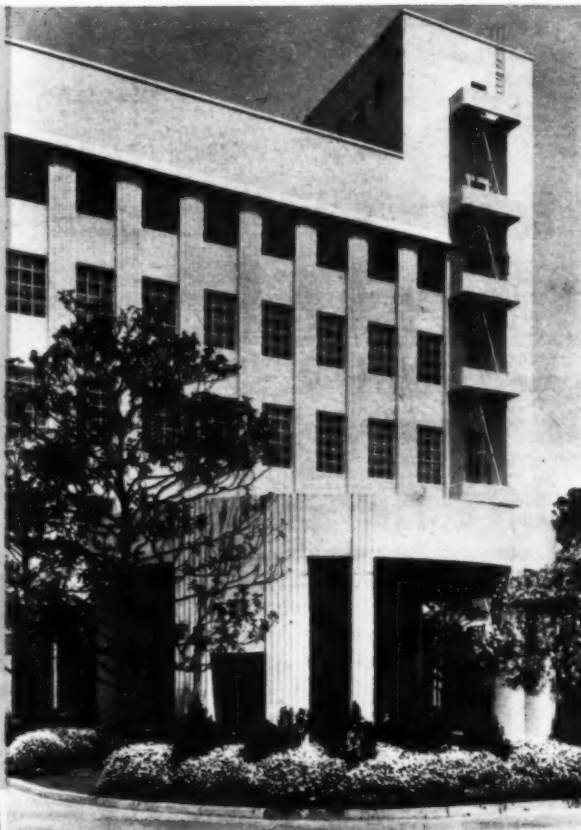
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Plyform scores twice in California

RIGHT: The new I. Magnin & Company building in Los Angeles is one of the most beautiful examples in the United States of just what Plyform will do. All of the surfaces on this structure except the flutings in the pilaster were formed against Plyform panels. Hunt & Chambers, architects. Wm. Simpson Co., contractors.

BELOW: The new Whittier High School in Whittier, Cal., shows how easily curved forms can be built of Plyform. In addition to the smooth surfaces on this job, Plyform gave numerous re-uses. William H. Harrison, Los Angeles, was architect.



1. Plyform serves as sheathing and lining combined!
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BROTHER!

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WITH A **FIST GRIP** ... NOT A
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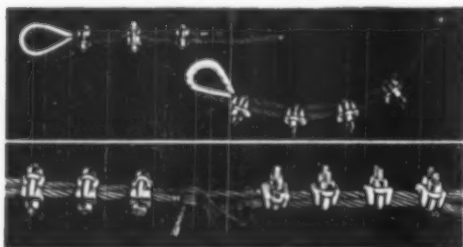
Laughlin drop forged Safety Clips grip around wire rope like a fist—the rope stays straight—uncrimped—can be used again when the clips are removed.

None of the narrow "finger-pinching" you get with ordinary U-Bolt clips which bow the wire—crimp it—and eventually break it.

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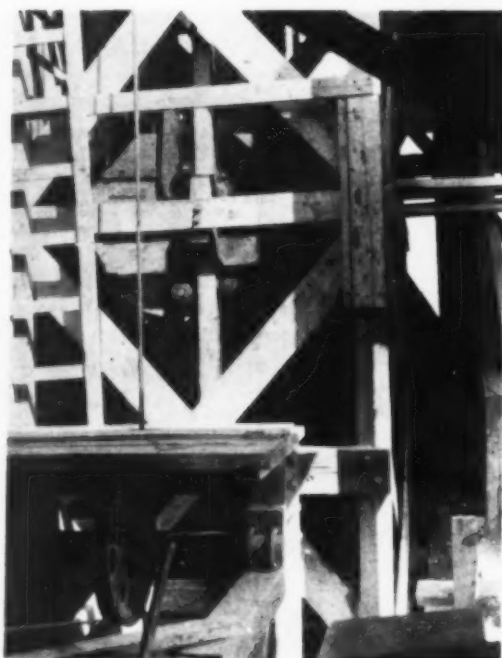
EYE HOOK



GRAB HOOK



SAFETY HOOK



TOWER BUCKETS, built up to 21-cu.ft. capacity from original 18-cu.ft. size, elevate sand and gravel from truck-filled hopper to overhead bins.

(Continued from page 84)

utilized nine of these carts, in all, for concrete distribution.

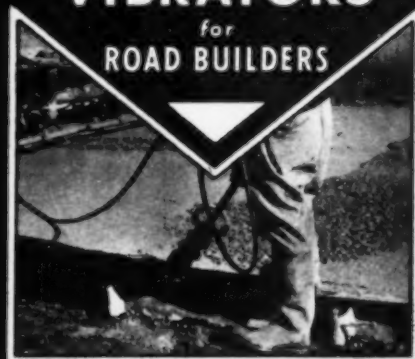
Form Stripping—Concrete was designed for a compressive strength of 2,500 lb. at 28 days. The cement factor was 5½ sacks per cubic yard, and the contractor used a uniform 4-sack batch for both mixers to simplify plant operation. Stripping of forms was permitted at 1,800-lb. strength. To check the strength, test cylinders were broken at 3 days. With a rare exception, the cylinders exceeded 2,000 lb. per square inch at 3 days, and forms were stripped clean in 3 to 4 days after concrete had been placed. Erection of forms for the next tier of a building was permitted on the day following slab placement.

Masonry Units—For exterior wall facing, each of the one-story buildings re-



TUBULAR STEEL TOWER and gasoline hoist are set in position to raise mason materials to second lift of double-deck scaffolding.

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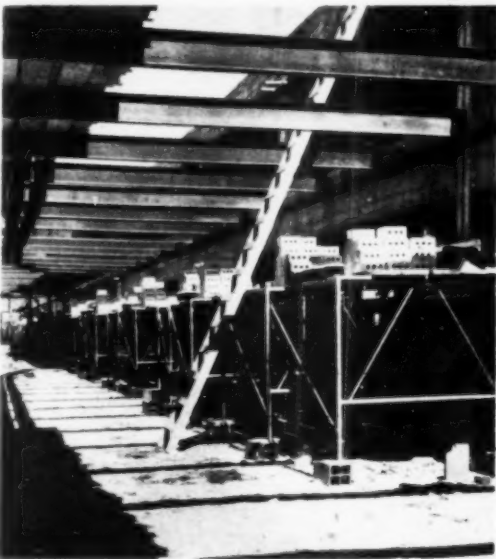


MARTIN-DECKER CORP.

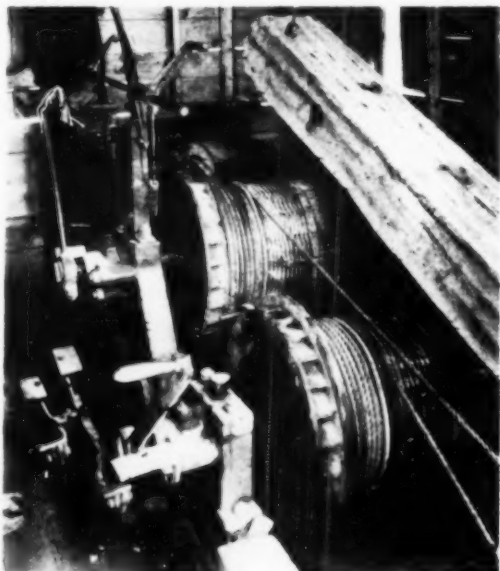
LONG BEACH, CALIFORNIA

quired 95,000 white mingled face brick, and the two-story building took 125,000. Common brick quantities were 91,000 for a one-story structure and 120,000 for a two-story. Red vitrified brick used for pier dado and for backup of roof parapets totaled about 30,000 units per building.

Hollow clay tile was used for backup of end walls only. Each building required about 5,000 pieces made to a special size of 7½x8x12 in. to permit laying two tile



WELDED TUBULAR SCAFFOLD UNITS provide working platforms for brick masons along 450-ft. side of building. Contractor utilizes 2,500 lin.ft. of scaffold units to permit erection of two tiers along both sides of building simultaneously.



DOUBLE-DRUM HOIST, gear-driven by electric motor equipped with hand-operated speed control, runs two buckets in elevator tower.

courses between brick header courses, the brick being laid up with six courses between headers. For interior partitions, the job consumed about 100,000 clay tile, 6x12x12 in. Other masonry units for the four buildings included a carload of raggle block for roof flashing and a carload of flue tile for gas unit heaters.

Roofs — Covered platforms on two sides of all four buildings have Fenestra metal roof decks welded to steel purlins. The 24-ft. platform, designed for use as a sales arcade and inclosed with welded steel sash,

(Continued on page 88)

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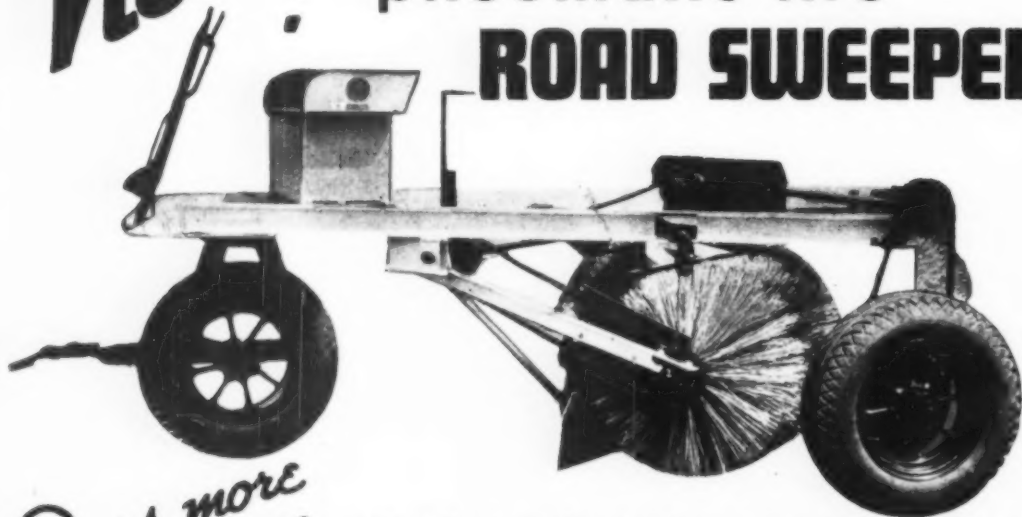
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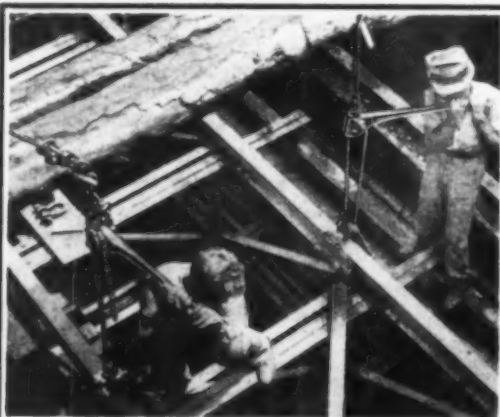


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Write for new catalogue G-1

COFFING HOIST CO.

CM STREET, DANVILLE, ILL.

(Continued from page 87)

has its roof insulated with 2 in. of Celotex fiber board topped by built-up roofing. On the roof deck of the 12-ft. carloading platform, insulation consists of 1 in. of Celotex under built-up roofing. Similar 1-in. insulation and built-up roofing is placed on the concrete roof slabs of the four buildings.

Administration—A PWA grant furnished 45 per cent of the cost of the Kansas City, Kan., food market and terminal. Of the Associated Engineers and Architects who designed the buildings and structures involved in the project, Gentry, Voskamp & Neville, Kansas City, Mo., were architects for the produce buildings. William J. Nauman, Jr., was chief resident engineer-inspector for PWA, and E. J. Welch was representative on the job for the architects.

For the S. Patti Construction Co., contractor, Kansas City, Mo., G. G. Manlove, general superintendent, and E. H. Farrar, assistant superintendent, were in charge of constructing the four produce buildings.

DIESEL TRACTORS ON Tough Levee Job

(Continued from page 44)

After placing 87,000 cu.yd. of fill in a hole washed out by a creek near Mercedes, Tex., Contractor Briggs had a large part of his equipment working on the diversion channel, or North Floodway. An elevating grader and seven Euclid track-trucks were handling the long hauls while the tractors and scrapers constructed the other sections. On one especially tough stretch of gumbo the elevating grader could not load the trucks, so a shovel was installed, but due to the seasonal rains, the trucks could not get sufficient traction to move the earth economically. Knowing that his regular tractors and scrapers could not handle such long hauls profitably, Mr. Briggs requested Allis-Chalmers to let him try the high speed tractors on this long-haul job before he returned them.

This request was granted and the tractors moved to this job. The shortest haul was 1,875 ft. round trip on which four scrapers averaged 10.1 trips and moved 76 pay yards every hour. On the longest haul, 5,900 ft., the scrapers averaged 42.4 pay yards per hour. After this performance Contractor Briggs bought the complete fleet of experimental tractors and scrapers.

Yardage Moved

On the four jobs these tractors moved 1,057,000 cu.yd. of bank measure dirt on an average one-way haul of 665 ft. and every yard was hauled up grade, just the

(Continued on page 90)

SLOW DOWN ROPE WEAR!



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Nothing less than a Modern SKILSAW can give you SKILSAW's time-and-cost-cutting performance ... because no other saw has the power and speed and ease of operation you have a right to expect when you buy an electric handsaw!

Test SKILSAW on your toughest sawing job and you'll see why it is preferred by builders everywhere—why it saws faster, easier, deeper—why it offers the most for your money! 20 years of constant improvement have made this original electric handsaw THE BEST on the market today! All ball bearing construction. Works from light socket. 9 POWERFUL SIZES for wood, metal, stone, and compositions.

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(Continued from page 88)

reverse of the average highway job. The job was completed Sept. 27, 1939 in 160 working days. The average yardage per actual hour worked for each tractor-scraper unit over the entire job was slightly over 100 cu.yd per hour.

The 15-yd. cable-operated scrapers used on this job help speed up the earth-moving cycle through the ease with which they unload the tightly packed bowl resulting from pusher loading. A new feature of these scrapers was found very helpful on the job. The cutting edge is stationary making possible a 24-in. clearance regardless of the bowl position, thus giving the scraper a blading ability even though the wheels sink in the soft fill.

★ ★ ★

HOW TO GET BETTER SERVICE FROM Wire Rope

(Continued from page 50)

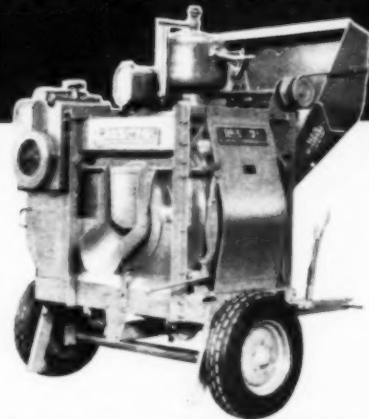
sign, so that smaller sheaves and drums must be used, in which case less than the maximum average service must be expected. This, of course, is recognized and accepted, and the rope construction must be selected that will give the best service possible under the existing conditions.

The material of which the drums and sheaves are made must also be considered. The harder the metal, the greater unit pressure it will stand, so if sheaves must be small, rope life would be saved if the sheaves were made of harder material. Frequent inspection of the equipment should be made, and if the average rope service is found to be falling off, the answer may be found here.

Proper consideration must be given, of course, to the handling and installation of wire rope. The rope must be properly unreeled, or uncoiled, to prevent any loops or kinks being thrown into it. Proper attachment should be made at the drum and at other fixed ends. If a wedge socket is provided on a machine reasonable care should be used to see that the strands are evenly gripped and that no excess strand is forced into the working part of the rope. Sockets are used in many situations, but are often the cause of wires breaking close to the socket, as the result of vibration. In any position on a machine where the rope is seen to vibrate there is danger of the wires fatiguing at the ends where this motion is stopped. A better connection in many cases is made by means of thimbles and clips.

The third corner of the triangle has to do with the nature of the work. Unfortunately this varies and cannot always be

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predicted. It is bound to result in variable rope service; therefore, average figures should be used, and any very low or very high figures should be considered in connection with the actual working conditions at that time. These variations may be found on the same job, but more frequently the variation is between the work at one location and at a succeeding location. In the latter case the results that would be "remembered" from a previous location might not be possible at the new one. Of course, if the change is for the better, no one objects.

Lubrication of Rope

The question of lubrication is also important, and the lack of lubrication is frequently the cause of rope failure. The proper lubricant is one that will penetrate to the core, will not run off, and will protect the wires against the action of gases and liquids. With the wires properly coated, friction is reduced and the corrosive action of water, acid, etc., is retarded. If a rope remains unprotected for a long time water may get into the center, causing corrosion which cannot be seen from the outside. This, of course, shortens the life of the rope, and it is frequently hard to explain, because it is difficult to detect from the outward appearance of the rope.

Finally, a word or two regarding the personal element. Some operators naturally take better care of their equipment than others. Some of the difficulties mentioned above can be avoided by the good operator. Wire rope is really a machine with its own moving parts and should be treated as such. When a new rope is installed the machine should be operated for a while with a light load, or no load, until the rope can adjust itself. The operator can also avoid sudden stresses, which cause rapid deterioration and often sudden breaking of the rope. Unavoidable accidents happen, of course, to shorten the life of wire rope, but the experienced operator usually has a pretty good idea of what constitutes good and bad working conditions and handling, and knows whether or not the rope is getting the "breaks" it deserves.

★ ★ ★

Concrete Paving IN SOUTH DAKOTA

(Continued from page 59)

tamper. A new R-B finegrader, with a cross-over bridge, was used for fine grading, and an 8-ton Austin-Western Roll-A-Plane roller completed the subgrade.

Batching Plant—South Dakota specifications call for three sizes of rock (2½-, 1½- and ¾-in.), which made it necessary to have two Butler batching bins. Stopping at two bins naturally delayed truck-load-

(Continued on page 92)



Williams' "Superector" is made in 5 sizes—24 to 53". It handles both Hex and Square sockets from 1 to 4-½". Socket hole extends clear thru so nuts may be turned all the way down on any length bolt.



Big, husky, rugged . . . powerful enough to turn just about anything with threads on it — that's Williams' "Superector."

Here's a real "he-man" wrench for which there are dozens of uses on every construction job. Built with plenty of leverage for really heavy work, yet strong enough to thrive on the punishment that goes with that kind of service. And despite its almost unbelievable strength and power, the "Superector" is comparatively light in weight.

Williams' "Superector" is drop-forged — not cast. It has Quadruple Pawls and more teeth per socket. Ask your industrial distributor or write for descriptive literature.

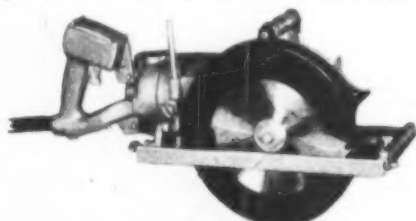


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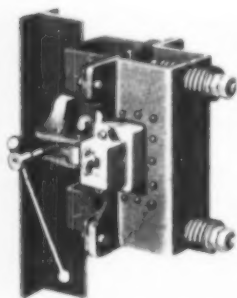
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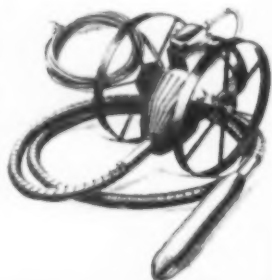


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(Continued from page 91)

ing operations and required rapid work at the set-up to avoid delays at the mixer. A Koehring 702 crane with a 2-yd. bucket handled all materials at the batching plant. Cement was furnished by the South Dakota Cement Plant, Rapid City, S. D. Thirty-five new two-batch trucks hauled to the paver.

Paving Operations—A Koehring 34E twin-batch paver equipped with a Cleveland trailgrader was used for actual paving operations. South Dakota specifications require mesh reinforcing, and a Koehring strike-off attachment was installed on the paver to strike off the concrete 2 in. below pavement surface prior to placing the reinforcing.

To finish the pavement surface, the outfit employed a Jaeger Type D finishing machine, equipped with two Mall vibrators for vibrating the concrete at the side of the forms and at expansion and contraction joints. Following a joint cutter of the contractor's own design, a Koehring longitudinal finisher took out any surface irregularities. After two beltings, the concrete was covered with burlap. The burlap was removed 12 hr. later, and the slab was covered with Sisalkraft paper blankets for a final 12-hr. curing period, after which the paper was removed and the joints were filled with an asphaltic joint filler.

Water and Light—Furnishing water to the project presented quite a problem, as the water had to be pumped from an artificial lake about 10 mi. away. For this pumping, it became necessary to install two triplex pumps. To overcome the handicap of short days, each operating unit was equipped with an individual lighting system, and the highway itself was lighted with a portable 10-kw. plant mounted on wire wheels with pneumatic tires.

Stabilized Gravel

Included in the project was 18,000 cu.yd. of earth shoulders covered with 33,323 tons of stabilized gravel. Specifications called for the latter material to be stabilized at the source, making it necessary to do all mixing in the pit. Material was run from the crushing plant into a Cedar Rapids traveling oil mix plant, which proved entirely satisfactory for mixing. To complete the project before freezing weather, the gravel plant worked 24 hr. a day.

Stabilized gravel was taken directly from the mixing plant by trucks to the highway and was spread in two separate lifts by a motor-patrol grader, each lift being compacted with a pneumatic roller. The final lift was rolled in addition with a 10-ton steel roller.

At 4:30 p.m., Nov. 4, the entire project was completed. A few hours afterwards weather conditions so changed that had the project not been finished at that time it would have been carried over until the 1940 working season.

Supervision—Paving of the 14.8-mi. section closed the last gap in a concrete highway between Sioux Falls, S. D., and Sioux City, Iowa. G. A. Coffey, field superintendent, supervised the work for the Northwestern Engineering Co., of which the writer is president. The concrete su-

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perintendent was J. J. Taaffe, and Emil Christensen was in charge of gravel operations. Kenneth Benson, resident engineer, was in charge of the project for the South Dakota Highway Commission.

★ ★ ★

Prefabricated Tunnel UNDER MOBILE RIVER

(Continued from page 45)

the project, including approaches, is 3,441 ft., and the overall cost is about \$4,000,000.

Tunnel sections are fabricated by the Alabama Drydocks and Shipbuilding Co., Mobile, launched and lined with 18-in. of reinforced concrete before being floated to position for sinking. The sections consist of welded octagonal rings covered with inner and outer skins of welded steel plate. A blanket of concrete 2 to 3 ft. thick will be placed around the tube by tremie. The Murnan Dredging Co. is subcontractor for about 1,000,000 cu.yd. of dredging.

Work on the project was about 50 per cent complete on the first of the year, and the tunnel is expected to be open for traffic this fall. Wilberding and Palmer, Mobile, are consulting engineers for the city.

★ ★ ★

Winter Concreting AT GRAND COULEE

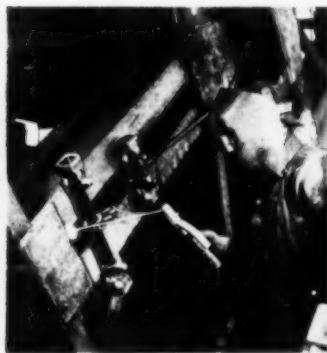
(Continued from page 60)

top of the blocks following completion of the pour. At the mixer plant, a boiler provides steam for heating aggregates and water before these materials go into the concrete mixer.

Temperatures that control pouring operations are read on thermometers embedded: (1) 1/2 in. below the surface and 1/2 in. in from each form line at the corner of blocks on the downstream face or (2) at the high point of blocks, leaving one third of the thermometer bulb exposed to the air. When the air temperature is 32 deg. F., or lower, if any of these special thermometers record temperatures of 50 deg. F., or lower, in blocks less than 72 hr. old (or 48 hr. where calcium chloride has been used), concrete placing operations must stop.

Grand Coulee dam is being built by Consolidated Builders, Inc. under supervision of the U. S. Bureau of Reclamation.

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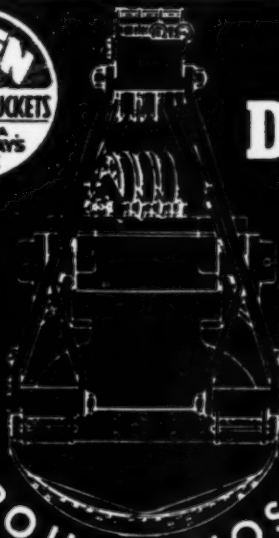
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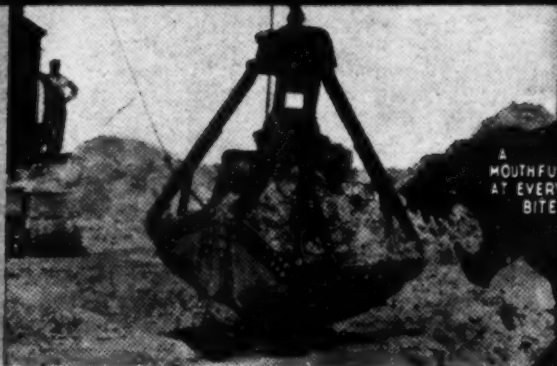


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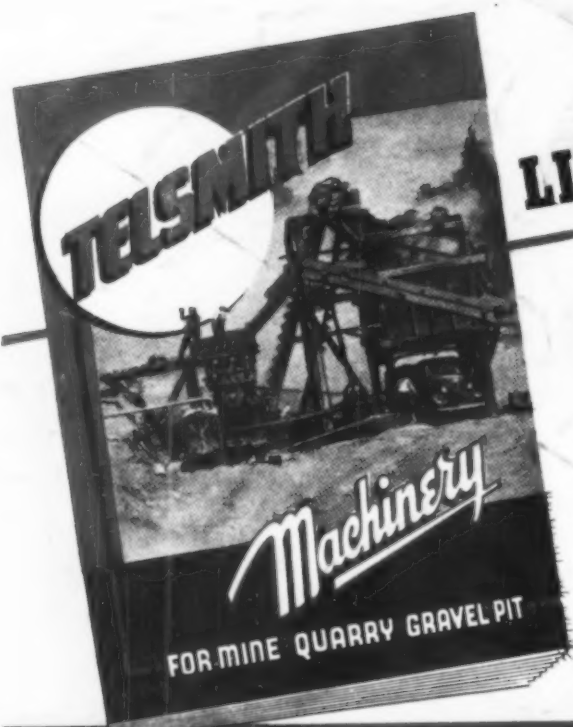
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